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APRIL 2016 VOL. 68, NO. 4



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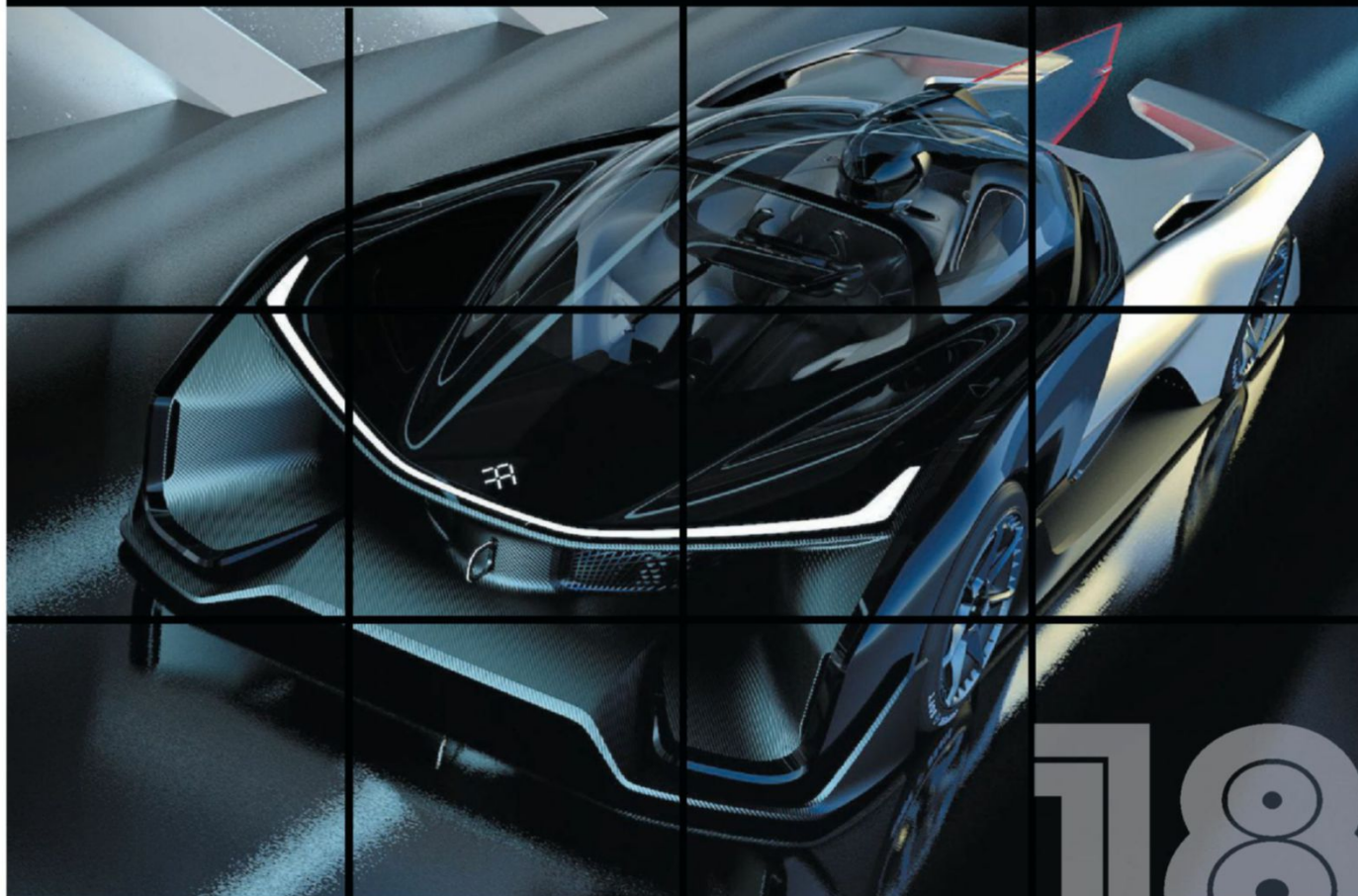


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# The Lohdown



## Can You Envision Chinese-Made Cars?



Because, like it or not, they're coming. On the eve of the 2016 North American International Auto Show, I found myself across from Comerica Park (home of the Detroit Tigers) at the Elwood Bar & Grill with Volvo president and CEO Håkan Samuelsson. We had both come to town for the Detroit auto show, and on my flight in, I reviewed the correspondence we received on our January Of the Year issue. One note, in particular, stood out to me. It was sent by a Mr. James Daniels, who wrote:

"I have to agree with you on your choice of SUV of the Year. It is not often I stop by a car dealer with the family, but my wife will be needing a new car in the future. We stopped by a dealer that has Cadillac, Mercedes, BMW, Volvo, Subaru; nothing seemed to fit. The salesman then said, 'Well, we just got in a new Volvo that we cannot sell; it is for demonstration purposes only.' It was an XC90. The whole family looked the car over, inside and out, and was impressed. As I was not able to purchase that XC90 at that time, I had time to research this vehicle. What I found out is that Volvo has changed hands again. Volvo's XC90 is now a Swedish automobile, owned and built in China for the sole purpose of sale in America. I will be looking for another vehicle that keeps my hard-earned money closer to American workers' pockets."

I shared these comments, including the erroneous claim that the XC90 is built in China instead of Sweden, with Samuelsson and asked him what he would tell potential customers like Daniels.

"I would say Volvo is a very Swedish company with our heritage going all the way back to '27 and the safety and all of that," he said. "And I think still that if you go into the engineering department, management, and executive management of Volvo, you see it is a European company—very, very few Chinese. They are a very stable owner; they have really given us a chance to come back as an independent brand. But it's definitely a European-Swedish company with Chinese owners. We are also now taking the step to be a domestic brand in the U.S. by building, for the very first time, a factory here in the U.S. So I think there is definitely no reason to see us as a Chinese company. Volvo is still Volvo, and we are on the track to being more independent and more—more Volvo than ever in our history."

Samuelsson's considered response illustrates the tightrope he must walk while balancing the demands of Volvo customers, Volvo's brand identity, and its parent company, Zhejiang Geely Holding Group of Hangzhou, China.

But neither Daniels' outrage nor Samuelsson's attempts to placate are new or original. Variations on this call and response have been heard since the very first imported cars went on sale in the U.S. We still regularly receive comments asking us to consider where the profits on Toyota cars and trucks go—and that is a brand that has been selling vehicles in the U.S. since 1957.

What China brings to this discussion is much more complicated and fascinating. As a rising superpower, China is our rival in many ways, as presidential aspirants keep reminding us this year. But China is also one of our largest investors; Chinese companies have invested heavily in American technology and entertainment brands

in recent months, and the Chinese billionaires and millionaires created by these deals continue to snap up real estate coast to coast.

China is also America's manufacturing base; you'd be hard-pressed to find an American brand that doesn't use Chinese factories at some level. Just look on the tag on your sweatshirt or sneakers, on the back of the bag of shrimp you picked up in the frozen foods section, or the fine print on the back of your phone. The laptop

this column was written on says "Designed in California, Assembled in China" on the bottom.

So if we have exported the production of everything from refrigerators to iPhones to frozen seafood to China, why should we, as Americans, have a problem when it comes to cars? If we're OK driving American trucks made in Mexico, German SUVs assembled in Alabama, and Japanese cars built in Indiana, why does China matter now?

In our Detroit show roundup starting on page 58, you'll see the new Volvo S90 sedan, which has been designed and engineered in Gothenburg, Sweden. It will be produced in factories in Sweden and China for sale around the world. You'll also find the Buick Envision—a midsize crossover built in Yantai, China. It was selected by our colleagues as *Motor Trend China's* 2016 SUV of the Year. GM thinks quite highly of it, as well; it goes on sale in the U.S. this summer as GM's first ever Chinese-built vehicle. ■

**Why should we, as Americans, have a problem when it comes to Chinese-made cars?**

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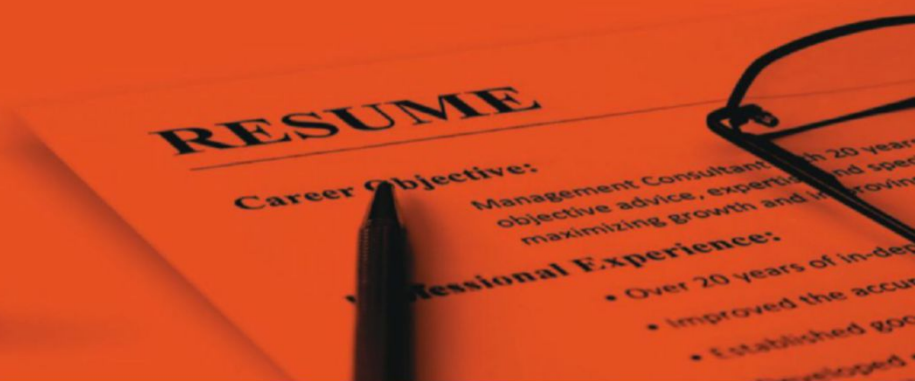




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## TREND 4.16

**INTAKE P16**

THIS MONTH'S HOT METAL

**WE SAY P22**

WORDS FROM OUR EDITORS

**DETOUR P26**

GEAR, FACTS, INFO

# BMW i Vision Future Interaction Concept

BMW i VISION FUTU



**KNOBLESS OBLIGE** Gesture controls, a console-mounted touchpad, and voice controls mean there are several ways to accomplish any task without loads of buttons.



BMW's CES concept car does look a bit like an i8 Concept Spyder, but the

news is mostly inside. The i Vision Future Interaction concept welcomes the era of the networked cockpit and features gesture control, 3-D displays, new touch-sensitive surfaces, enhanced voice control, varying degrees of autonomous driving capability, and of course the Internet of things.

When tackling that favorite twisty back road in Pure Drive

drive-it-yourself mode, the head-up display and all the support screens present all vehicle-system vital functions in a focused manner. The most pertinent info appears on the HUD, including things such as indicating the ideal driving line or braking points on selected stretches of road. (We'd guess the Tail of the Dragon, near BMW's South Carolina factory, will be supported.) The 3-D instrument cluster display (it works without those goofy movie-theater glasses) provides secondary info

such as consumption and range data along with safety information about vehicles ahead, even when they're not yet within your field of view.

When you hit the freeway carpool lanes for the slog back

home, engage Auto mode. The steering wheel retracts a few inches, and the driver seat re-contours itself a bit, allowing the driver to more comfortably view the central 21-inch panorama display. This and



**TARGETED** Content on all three displays varies between Pure, Assist, and Auto driving modes.



**“We need to consider much stronger the needs of the U.S. market.”**

4.16 **TREND**

## THEY SAY P29 INTERVIEW

**JOERG SOMMER**, VP OF PRODUCT MARKETING, VW U.S.

## YOUR SAY P32 READERS TALK BACK



An in-between Assist mode networks the car with the infrastructure to provide the best real-time navigation routing, taking all traffic and weather conditions into account and intervening to avert danger. The steering wheel illuminates to help provide visual confirmation of which drive mode is engaged.

AirTouch gesture controls are used when interacting with the communication and infotainment features, allowing that panorama screen to be used like a touchscreen without any fingerprint-marring contact. The driver or passenger can point at an item as sensors determine the target of the point, highlighting the item. Then the gesturing hand can make a pressing motion toward the screen to confirm or use an “enter” confirmation button mounted on the steering wheel or passenger door. Touch-sensitive surfaces on the center console provide tap, swipe, and sliding motion control of the main screen, as well, and voice commands can select among the various menus.

The front end features BMW’s still-not-U.S.-legal laser headlamps. Another BMW CES innovation on a different vehicle but worthy of note is called Bumper Detect, which triggers cameras to capture video if another vehicle bumps into yours (hopefully seeing a license plate in the process) or if someone tampers with the car. Any such contact also triggers a text message to the owner, with images on request.

Expect to see most of these features filtering into production BMWs over the next few years.

**Frank Markus**



## Volkswagen BUDD-e Concept



The Volkswagen BUDD-e Concept, an electrified van that showcases a new platform and a next-generation multimedia interface, made its debut at CES. Featuring two electric motors and a flat 101-kW-hr battery, the BUDD-e rides on Volkswagen’s new MEB platform, designed specifically for electric vehicles. The BUDD-e can travel up to 373 miles on a single charge, though that figure is based on the New European Driving Cycle; EPA numbers might be closer to 230 miles, VW says.

The BUDD-e’s exterior design was inspired by the classic Microbuses, which were produced for two generations from the 1950s through the 1970s. Like the van that inspired its design, the BUDD-e puts

practicality first and features a clean, restrained exterior. The car also has an upright greenhouse for maximum interior space, just like the Microbuses of the past.

One of the most notable features on the BUDD-e concept is its next-generation multimedia system, which has a curved 12.3-inch display with three configurable sections. The Active Info Display is the main component of the BUDD-e’s infotainment system and can be customized extensively. VW says that the phrase “Hello, BUDD-e” will activate the car’s voice control, which responds to natural speech interaction.

The infotainment system will also allow you and your passengers to link with the outside world. Passengers can access their smart homes to turn on the air-conditioning, check to see if anyone’s in the house, and handle other tasks remotely. Should you forget something before heading off on a road trip, the BUDD-e will also let you order online and have it delivered straight to your car’s drop box, which can be accessed

from the outside via an access code.

Although it’s unlikely that the BUDD-e will make it to production, the features it showcased at CES will probably find their way into future production vehicles. **Stefan Ogbac**

the other displays also present different content in Auto mode; in Auto, the sensor technology is able to predictively provide at least 5-7 seconds of notice before the driver must resume control of the car. That high-def panorama screen measures 15.7 inches wide by 4.3 inches tall and can display info from BMW’s Open Mobility Cloud, the user’s smartphone, or BMW Connected Apps, providing drive-mode-appropriate content. So a voice phone call could change to a video call when the autonomous mode is engaged.



**TECH HEAVY**  
The Active Info Display takes vehicle infotainment to a new level.



# Intake

FIRST  
LOOK



**KEEP DREAMING**  
Faraday Future could surprise us with a small production run if the FFZERO1 generates enough interest—backed by cash.

## FFZERO1 Concept



Faraday Future, the secretive EV startup that prefers to go by just “FF,” has unveiled its first-ever car, a concept race car called the FFZERO1. Described as a “proving ground” for the company’s engineering, design, and technological skills, it’s unlikely to ever go into production.

A combination of design exercise and technology showcase, the FFZERO1 is a single-seat electric race car. If it were to go into production, FF says, it would have four electric motors producing more than 1,000 hp together, hit 60 mph in less than 3 seconds, and reach more than 200 mph. Details on the company’s first production car remain a mystery.

Being a concept from a virtually unknown company, many of the

FFZERO1’s features are qualified with words like “could” and “might,” but here’s what we know: The FFZERO1 is built on the company’s Variable Product Architecture, a skateboard-type chassis not unlike Tesla’s, which holds the battery, motor(s), suspension, and drivetrain electronics. VPA will be the basis for all of the company’s models and can be fitted with one, two, or three electric motors in front-, rear-, or all-wheel-drive layouts.

Powering the FFZERO1 and all future FFs is a long, flat package of batteries arranged in what FF is calling a “string.” Designed as a group of individual modules rather than one complete battery pack, FF says its design charges faster, holds more energy, and is safer in the event of a fire. Moreover, the company says modules can be



swapped out if they get damaged or wear out rather than replacing the whole pack. The standard pack is understood to have a capacity of roughly 100 kilowatt-hours.

The concept features a number of elements unlikely to make production, but some of the concept’s features will transfer over to future production models. The concept is built from “lightweight and composite materials,” as will be production models. The “UFO line” around the body will be a signature design element of future FFs, as will the “propeller-shaped” dashboard.

Technology that allows for “adaptive personalization, seamless transfer of custom vehicle configurations, access to live images, and real-time data visualization” will also show up in production models. What it will actually do is anyone’s guess.

FF also recently announced plans to build a \$1 billion, 3 million square-foot factory in North Las Vegas, Nevada, to make its future production cars. Predicted to employ about 4,500 people, the still hypothetical factory is slated to produce its first car in 2017.

**Scott Evans**

**The FFZERO1 would have four motors producing more than 1,000 hp together.**





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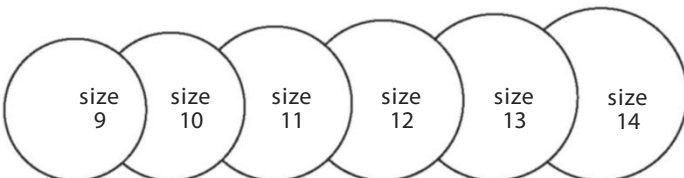
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# Intake

## 399 GM Ignition Switch Victims Paid



General Motors paid \$594.5 million to victims of the ignition switch disaster, according to a report from the GM Ignition Compensation Claims Resolution Facility. This comes in below the \$600+ million GM originally set aside.

According to the report, 399 of the 4,343 claims received by the fund were eligible for compensation. However, the report also says that 74 percent of approved death claims and 61 percent of all approved claims involved at least one contributory negligent behavior from the driver. Some of the top behaviors include failure to wear a seat belt, excessive speed, and driving under the influence.

The fund says that it “expressly ignored” evidence of contributory negligence from the driver in doling out payments. “In such cases, claimants would confront serious legal challenges if litigating in the courtroom. By ignoring any evidence of such contributory negligence, the Program proved to be a preferred avenue for individuals seeking compensation,” the report stated.

Last year, GM appointed attorney Kenneth Feinberg to head a compensation fund. GM determined death claims were eligible for up to \$1 million, not including \$300,000 for each dependent and a surviving spouse. Victims with minor injuries could still receive between \$20,000 and \$500,000.

But GM's problems are far from over. In September, it shelled out \$900 million in a criminal settlement related to the fiasco, and it still faces a slew of personal injury and death lawsuits in the near future.

Feinberg's next job is handling the VW diesel fallout. **Kelly Pleskot**



## IIHS Tightens Top Safety Pick Criteria

For 2016, the Insurance Institute for Highway Safety has made it more difficult for cars to earn its coveted Top Safety Pick and Top Safety Pick+ awards.

For the agency's highest award of Top Safety Pick+, cars must now earn Good marks (the highest rating) in the small overlap test. And like last year, they must also achieve an Advanced or Superior rating in front crash prevention.

Vehicles also must earn a Good rating in the small overlap test to qualify for Top Safety Pick. Previously, IIHS only required cars to score Acceptable in this category to earn either award. IIHS also now requires some sort of front crash prevention technology for its Top Safety Pick candidates, which must earn the minimum score of Basic.

Despite the stricter requirements, 48 vehicles meet the criteria for the 2016 Top Safety Pick+ award. **Kelly Pleskot**



MIKE CONNOR

## MTCONFIDENTIAL

All the rumors suggest a replacement for the Nissan GT-R isn't coming until at least 2020, so it's no surprise the company is working on more variants of the current car to keep interest (and sales) up. We spotted a camouflaged GT-R out running the canyons in the company of a 911 Turbo S and an AMG GT S, the same cars it lost to in our comparison last year. Also at the party: a manufacturer-registered Maxima and, oh, a Gold Edition GT-R, the car that lost that comparison. Seems pretty obvious Nissan is trying to up the current car's game...**Mercedes-Benz is hard at work on the E63 variant of the upcoming W213-generation E-Class.**

That supersedan is expected to lose a good deal of weight thanks to the C63 and AMG GT's twin-turbo, 4.0-liter V-8 replacing the previous twin-turbo, 5.5-liter V-8. Although displacement will be down from last year, we hear power will be competitive. The engine will be mated to a nine-speed version of AMG's torque-converter-free SpeedShift MCT transmission, and power will be routed to all four wheels through an all-new all-wheel-drive system. Expect this version of the E63 to be much more track-focused than all previous versions...

**Is Volvo considering an X6-fighter?** The S60 Cross Country has performed as expected and failed to light any fires. It appears, though, that the experiment was successful enough to have Volvo considering a real SUV coupe like the X6 or GLE Coupe rather than just a lifted sedan. Volvo has already modeled some designs... On a more personal note, I'll be taking bets on whether **the upcoming F-150 hybrid will be a bigger flop than the Silverado Hybrid.** I'm wagering the diesel F-150 prototype spotted recently has a much better shot with truck customers.

## Randy Pobst Inducted Into SCCA Hall of Fame

The Sports Car Club of America has inducted *Motor Trend's* very own Randy Pobst into its hall of fame. The veteran race car driver was honored for being a prime example of what's possible through club involvement.

Pobst began competing in motorsports in college, which is relatively late in life for a pro race car driver. He started competing in autocross, where he earned six Solo National Championship titles during the 1980s. Pobst moved up to SCCA Club Racing and won two SCCA Runoffs. From there he climbed the ranks to the SCCA Pro Racing-sanctioned World Challenge series, where he has won more than 90 races.



Outside of SCCA, Pobst has racked up two class wins at the 24 Hours of Daytona, set multiple production car lap records at Mazda Raceway Laguna Seca, and, of course, contributed to the pages of *Motor Trend* both as our resident racer and as a talented automotive scribe in his own right.

The other 2016 inductees are former racer and team owner Roger Penske, Brumos Racing and Formula Vee founder Hubert Brundage, longtime SCCA steward and founder of the Showroom Stock class Bob Henderson, and 12 Hours of Sebring Founder Alec Ulmann. Both Ulmann and Brundage are being honored posthumously. **Alex Nishimoto**



# 2016 Volkswagen Beetle Dune



The Mexican jumping bean is not what it seems. Not only is it not a bean, but it also doesn't jump all by itself. What jumps is a moth larva that has eaten its way inside. When it moves, the "bean" (actually a seed pod) jumps, too. In a similar way, the 2016 Volkswagen Beetle Dune is an interesting novelty that isn't what it seems.

A new midrange trim level for the 2016 Beetle, the Dune was inspired by the Baja Bug, a classic Type 1 Beetle that has been modified for desert racing. This factory-built tribute is more about image than action, sporting new front and rear fascias, trim pieces, fender flares, wheels, tires, interior trim, and paint options.

VW has employed a few visual tricks to make the Dune look like it rides higher than it does. The front and rear fascias now have aluminum "skidplates" that are unlikely to provide any meaningful protection off-road but nonetheless draw the eye to their angled positioning to give the illusion of a higher nose and greater approach/departure angles. The new foglight and turn signal surrounds reach farther up the nose than before, making the nose appear to sit higher, and a new intake below the hood removes some visual mass from the front bumper. Polished

## Newcomer



aluminum trim pieces below the doors use the same trick, and the big spoiler on the trunk makes the beltline appear higher.

Off-road, the 0.4 inch of lift is about as helpful as you'd expect. Near Mount Charleston, north of Las Vegas, Nevada, we pulled off the highway and onto a well-maintained road consisting mostly of small rocks, sand, and dirt. The Dune took it in stride at first, but about 50 feet in we dragged the nose traversing a medium rut. Thank goodness for that skidplate. Roughly 300 feet later, we called off the expedition on account

of a much larger rut the car clearly wasn't going to cross safely. We managed not to drag the nose again during our retreat to the safety of pavement. Back in its natural environment rather than its aspirational one, the Dune drives like any other Beetle. That is to say, pretty well. We also approve of the new paint and interior trim options.

It's not a modern Baja Bug, but it'll look pretty good parked next to the one in your garage, and you'll never have to do a valve adjustment. (Hurray!) **Scott Evans**

## It's not a modern Baja Bug, but it'll look pretty good parked next to one.



**SPECIFICATIONS** Base Price \$24,815 **Vehicle Layout** Front-engine, FWD, 4-pass, 2-door hatchback or convertible  
**Engine** 1.8L/170-hp/184-lb-ft turbocharged DOHC 16-valve I-4 **Transmission** 6-speed automatic **Curb Weight** 3,100-3,250 lb (mfr)  
**Wheelbase** 100.0 in **L x W x H** 168.7 x 71.7 x 58.4-59.1 in **0-60 MPH** 7.8 sec (MT est) **EPA City/Hwy/Comb Fuel Econ** 25/34/28 mpg  
**Energy Consumption, City/Hwy** 135/99 kW-hrs/100 miles **CO2 Emissions, Comb** 0.68 lb/mile **On Sale In U.S.** Currently



# We Say...



Ron Kiino  
**THE KIINOTE**

## The \$50,000 Conundrum Wolverine or Bear?



If you had \$50,000 to burn on a sport sedan, would you opt for an all-wheel-drive compact with a high-strung turbo-four or go for a rear-drive full-size with a burly naturally aspirated V-8?

That's the question that crossed my mind when, by happenstance, Chris Walton's intro on our new long-term 2016 Audi S3 and Jonny Lieberman's review of a 2015 Chevrolet SS came across my computer screen on the same day. Here were two dissimilar sport sedans that, surprisingly, offered conspicuously similar levels of performance at a parallel price point. Normally, cars boasting comparable chops and wearing window stickers within a pittance of each other reside in the same category—as in, the exact same category. Think BMW M3 and Mercedes-AMG C63. But in the case of the S3 and SS, we're talking about way, way different vehicles. Or are we?

(Quick note: For a more apples-to-apples comparison, the performance numbers in this story come from an SS automatic we tested back in 2014; Lieberman's review covers an SS with a manual transmission. For full info on the manual Jonny drove, check out [motortrend.com](http://motortrend.com).)

Whereas the Monroney on Jonny's 2015 SS manual was \$48,040, for a 2016 SS automatic optioned with the available \$900 sunroof—the closest laundry list to that of our long-term S3 Premium Plus—the price would be \$49,770, or a fancy steak dinner shy of the \$49,950 Audi. Either way, it's 50 grand. And



either way, it's 13.0 seconds flat in the quarter mile. But, oh, how they get there ...

At 3,420 pounds, the 175.9-inch-long S3 isn't exactly a featherweight for its size, though to balance the scales with the 3,913-pound, 195.5-inch SS, it would need a wolverine and a momma grizzly wrestling in the back seat. But thanks to a brilliant Quattro all-wheel-drive system; a rapid-fire dual-clutch auto; and a 292-horsepower, 2.0-liter turbo-four that, more important, doles out 280 lb-ft of torque at 1,900 rpm, the S3 leaps from 0 to 60 in just 4.4 seconds on the way to that 13.0-second quarter mile at 105.3 mph. The SS, on the other hand, spins only the rear tires, relying on a lot more horsepower (415) and torque (415 lb-ft at 4,600 rpm) from the 6.2-liter LS3 small-block to get its nearly two-ton package to 60 in 4.6 seconds (4.8 with Jonny's manual) and the quarter in an Audi-tying 13.0 ticks at 109.4 mph, its higher trap speed coming courtesy of those additional 123 horses. The Chevy's brakes are bigger



**GULP 'N' SIP** The Chevrolet SS' 415-hp, 6.2-liter LS3 V-8 gulps gas to the tune of 16 mpg combined. The Audi S3's 292-hp, 2.0-liter EA888 I-4 sips at 26 mpg combined.

(+0.6 inch front, +2.0 inches rear), and its tires wider (+10mm front, +40mm rear), but the 60-0 stopping distances are on top of each other—105 feet for the SS, 109 for the S3.

Roaring down a runway is one thing, hugging a corner another. Makes no difference with these two. They're still virtually neck and neck. Around our figure-eight course, the S3 clocked a hasty time of 25.0 seconds, a full 1.1 seconds quicker than the BMW 340i, by the way. If the Bimmer's the Ultimate Driving Machine, the S3's the Über Ultimate. And the SS? Oh, it's even more über, proving a hair hastier than the Audi at 24.8 seconds. Average lateral acceleration between the two—0.92 g for the SS, 0.91 g for the S3—is a wash.

Sure, the differences are stark (the SS has an engine over three times the displacement, and the S3 is a quarter-ton lighter), and the driving impressions are in sharp contrast (the Audi feels small, quick, and sure-footed, and the Chevy seems big, fast, and powerful), but both are deceptively deft at preying on big game. So do you feel like a wolverine or a bear? Either way, you're gonna feast. ■



To balance the scales with the SS, the S3 would need a momma grizzly in the back seat.



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# We Say...



Frank Markus  
**TECHNOLOGUE**

Illustration Kevin Whipple

## Head Game Can the auto industry save football?

➤ “If just 10 percent of mothers decide that football is too dangerous for their sons to play, that is it—it is the end of football.” That ominous warning from the sports biopic thriller “Concussion” expresses a growing concern as the world learns more about chronic traumatic encephalopathy (CTE), a brain condition brought on by multiple, successive concussions and sub-concussive hits to the head. It was considered a factor in the suicides of former NFL stars Junior Seau and Dave Duerson, among others.

Concussion is a functional injury to the brain that, at least for now, cannot be detected by an MRI or other imaging tests. Currently the best means of diagnosing it is the Balance Error Scoring System (BESS) test, developed at the University of North Carolina. It requires that the athlete or subject stand in three poses for 20 seconds each, hands on hips with eyes closed and shoes off, first on a firm surface and then on a 2.5-inch-thick foam pad. An observer notes any “errors”—eyes opening, hands off hips, sway of 30 degrees or more, etc. There must be a baseline test before injury to compare with post-injury results. If the total error count increases by nine or more, concussion is probable. Trouble is,

subjective “error” measurement is in the eye of the beholder, and if the beholder is a coach hoping the star QB can get back out there and clinch the division championship, that ninth error might go “unnoticed.”

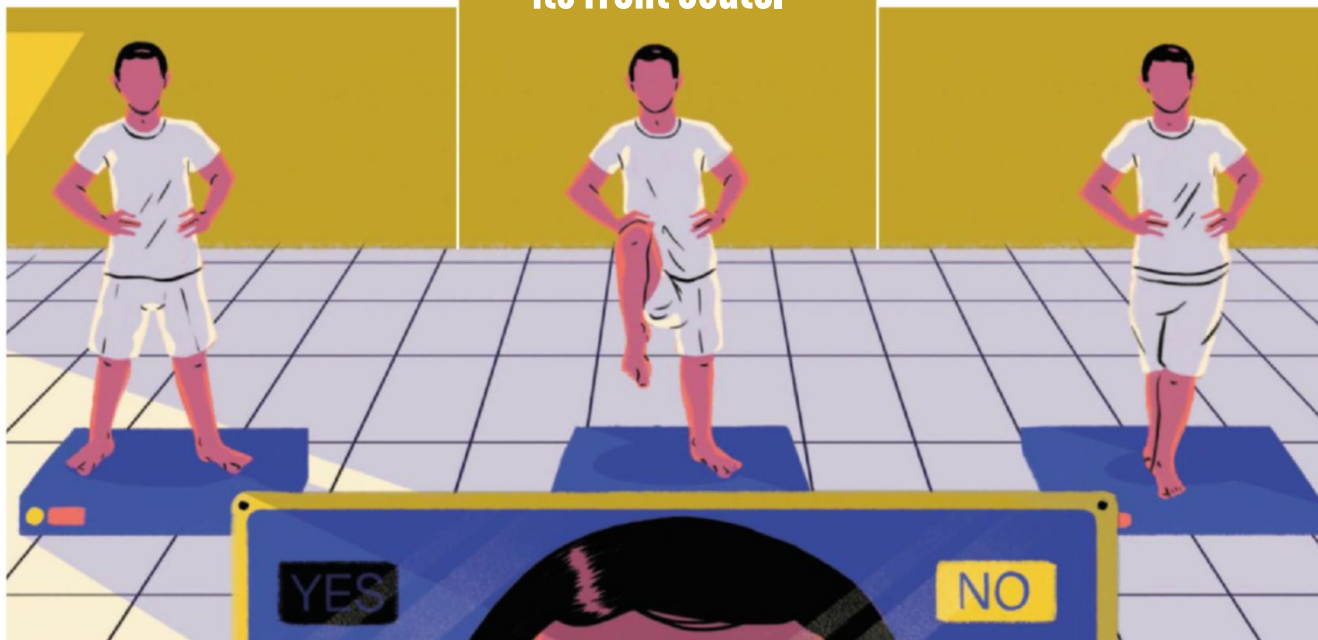
When the UNC team originally developed its scoring system, it conducted numerous balance tests in a climate-controlled chamber on a \$50,000 balance plate capable of measuring the subject’s motion in minute detail. This data provided objective guidance for determining what constitutes a subjective error on the BESS test, but obviously such plates can’t easily be collocated at football or soccer fields. Former Ford legal counsel Walter J. Borda’s knee doctor just happened to be chatting with him about this balance plate and its potential usefulness in concussion detection when an idea struck Borda: “Let’s

“Let’s make a portable force plate using the four mass sensors that every new car has on its front seats.”

make a portable force plate using the four cheap mass sensors that every new car has on its front seats to weigh occupants for the airbag system.”

Borda then rang up some engineering pals you may have heard of—among them *Motor Trend* Car of the Year guest judge and “father of the Ford GT” Chris Theodore, former Corvette chief engineer Tom Wallace, and former Ford safety technical fellow Priya Prasad. Three years later, Safety in Motion Inc. has a raft of patents pending and is readying beta test units to commence data acquisition. The device uses two 20-by-30-by-1-inch rigid aluminum honeycomb plates connected by four automotive-grade mass sensors in the corners. Their signals flow through a circuit board and a signal processor out to a laptop running SiM’s proprietary software, which prompts for each stance and then generates an objective BESS score. It weighs just 35 pounds and can accurately measure athletes weighing between 80 and 400 pounds even when it’s resting on soft ground, at temperatures between -40 and 140 degrees F.

SiM is targeting a sub-\$5,000 price, an accessible sum for school districts or booster-club fundraisers. It certainly seems a small price to pay to detect an initial concussion and possibly prevent a second one from occurring before the first has healed. And it was born in Detroit, of rustbelt auto-industry know-how. If your grandkids go out for football a decade or two from now, be sure they know to thank the Detroit car business for saving this all-American sport. ■





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This engine, which suffered irreparable damage during a race, was carefully crafted into a work of art worthy of center stage by craftsman Gergely Bajzath in the U.K. If you're the DIY type, check out his upcoming book, "How to Build Your Own Engine Coffee Table" (\$20).



**THE TITAN WARRIOR  
DESIGN TEAM** The group  
behind the concept is  
based at Nissan Design  
America in La Jolla,  
California. From left,  
Brenda Parkin, Randy  
Rodriguez, John Sahs,  
Taro Ueda, Antonio  
Manzari, and  
Julien Thiebaud.



## BACK OF THE NAPKIN

**RANDY RODRIGUEZ, PROJECT LEAD DESIGNER AT NISSAN DESIGN AMERICA**

Nissan designer Randy Rodriguez penned us a heroic sketch of the Titan Warrior concept, which made its debut at the 2016 Detroit auto show (see page 58 for more from Detroit). The Nissan Design America team, led by Taro Ueda, was responsible for the Warrior concept.



From the *Motor Trend* Archive...

## REARVIEW



50

APRIL 1966  
PRICE: \$0.50

"SPECIAL STYLING ISSUE!!!" Judging by the cover punctuation, we were pretty excited by our

April '66 look at car design. We touched on Detroit's styling direction, design in Europe, and classic design traits we thought could make a comeback. Elsewhere, we road tripped across the States in a Hemi-powered Plymouth and covered the Motor Trend Riverside 500.

APRIL 1986  
PRICE: \$2.25

We put the Shelby-infused Dodge Daytona CS up against the Pontiac Firebird Tran Am for an American GT shootout and took delivery of a Merkur XR4Ti long-term.

APRIL 2006  
PRICE: \$3.99

Porsche's legendary 911 took on three strong contenders: the Chevrolet Corvette Z06, the Porsche Cayman S, and the "world's best-looking coupe," the Aston Martin V8 Vantage.



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## K-band false alarms driving you nuts?

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# They Say

## Joerg Sommer

**VICE PRESIDENT OF PRODUCT MARKETING, VOLKSWAGEN U.S.**



Times are tough for Volkswagen. Plagued by a worldwide emissions cheating scandal, the company has seen its sales fall and its reputation tarnished.

As we went to press, the EPA rejected the company's proposal to fix its diesel cars. If Volkswagen is to recover, it needs a plan, and U.S. product boss Joerg Sommer gave us some insight into the company's next moves.

"We need to consider much stronger the needs of the U.S. market in our product planning," Sommer said. Now that he has been at his current post for about two years, he's already starting to see a change in the way things work. Executives in the U.S. have a more direct say in product decisions in Germany, and Sommer meets with designers to provide feedback on product usability from U.S. customers and dealers.

Often it's the little things that make a difference; European customers like cupholders that can be covered when not in use, but drivers in the U.S. prefer ones easily accessible and open. "Anything you do that is small and closed is not so convenient for the U.S. customer," he said. As far as changes on the tech side, Sommer says that VW's infotainment strategy should focus not on Europe but on the U.S. market first, considering America is the leader and trendsetter in this space.

Along with increasing its awareness of the U.S. market, VW's other big goal is electrification. Sommer, who headed Volkswagen Group's electric mobility, sales, and marketing before taking his current position, is quite familiar with the quest to electrify VW; the company aims to make electric vehicles into volume models. The e-Golf, currently VW's first and only full electric vehicle sold in the U.S., has seen a drop in starting price and will increase range by 30 percent on next year's model, which should give it more than 100 miles per charge. VW aims for future high-volume EVs to reach beyond 150 miles.

Toward the end of this decade, we'll see elements from the BUDD-e concept and its new MEB platform in action. "Whether this specific vehicle will materialize

### Interview



**We need to consider much stronger the needs of the U.S. market in our product planning."**

or not, that's something still to decide," he said. "But I think it was a vision model of technology we are committed to bringing to the market. It's not a research vehicle."

With more vehicles taking advantage of EV-specific platforms such as VW's MEB, previewed on the BUDD-e concept from CES, we can expect more from car interiors in the future. "This kind of car platform," he said, "will change the proportions of cars in a way that you get the interior size of one class of vehicle up because you can push the wheels out and you have very little overhangs because you don't need an engine compartment anymore." The platform can also accommodate multiple body styles. Sommer said the U.S. market will drive electrification, and that's why VW is investing \$7 billion in manufacturing plants between Mexico and the U.S. over the next few years.

Volkswagen won't, however, go all in on the MEB. "You need to have other electrification [options] in your portfolio for different customer needs," Sommer said. Many new cars will ride on the MQB platform, which can accommodate a variety of drivetrains, including mild hybrids, traditional hybrids, plug-in hybrids, and fully electric vehicles.

Will it all be enough? Previously, Volkswagen declared its goal to sell 800,000 cars in the U.S. by 2018, but it looks like VW isn't so consumed with that strategy anymore. But de-emphasizing the No. 1 sales position has not changed VW's overall strategy. "We are committed to the investments behind that [800,000 goal]," Sommer said. "There's right now no reason for us to deviate from that strategy. Whether it's the exact timing given the current situation, I don't personally know. But the product plan and the announcements for localizing the product is an essential part of the growth."

For now, VW Group has come out to say the company's top priority for 2016 is to regain the trust of consumers. It assures customers that the U.S. is still a core target, which Sommer said has become more market-oriented and capable of making decisions more quickly than in the past. Only time will tell how these skills will help VW weather the storm ahead.

**Kelly Pleskot**

**VOLKSWAGEN** will rely on the type of tech highlighted in the BUDD-e to save its reputation.





# THE TALE OF THE 2017 VOLT

AS TOLD FROM AN ENGINEERING AND DESIGN PERSPECTIVE.

We sat down with Executive Chief Engineer Pamela Fletcher and Executive Director of Global Design John Cafaro to talk about the engineering and design innovation that went into creating the revolutionary next-generation Volt.





## PAMELA FLETCHER

CHEVROLET EXECUTIVE CHIEF ENGINEER  
ELECTRIFIED VEHICLES

*What are some of the technological breakthroughs in the next-generation Volt?*

Customers tell us they love range, so we wanted to give them more range. We've fine-tuned the aerodynamics and drag coefficient, resulting in up to 53 miles of pure electric range;<sup>1</sup> nearly 40 percent more than the first-generation Volt. The new Voltec propulsion system optimizes two new motors for prime power delivery, while increasing efficiency. Volt offers up to 420 miles of total range;<sup>2</sup> without having to stop and plug in. The improvement in fuel economy and EV range will save time otherwise spent at the pump, as we expect owners to go over 1,000 miles between fill-ups by charging regularly;<sup>3</sup> providing a more convenient driving experience for our customers.

*What are the other differences between the first- and second-generation Volt?*

The first-generation Volt was a breakthrough vehicle, and the second-generation Volt takes that idea even further. Volt is the no-compromise electric vehicle with a gas-powered generator on board to take you hundreds more miles beyond its battery range. We worked around every system of the car to make it more efficient and the new vehicle is over 230 pounds lighter than its predecessor. We also have a new battery cell that delivers 20 percent more energy by volume;<sup>2</sup> It's more energy dense but weighs 21 pounds less than the Gen I Volt with a lot more capacity.

**“Customers tell us they love range,  
so we wanted to give them more range.”**

*Pamela Fletcher*

CHEVROLET EXECUTIVE CHIEF ENGINEER, ELECTRIFIED VEHICLES



## JOHN CAFARO

CHEVROLET EXECUTIVE DIRECTOR  
GLOBAL DESIGN

*How did you approach exterior design for the next-generation Volt?*

When we started putting pencil to paper on the Volt, we wanted something exciting-looking. We knew it was going to have four doors, but we really wanted something sleek with a coupe aesthetic. The biggest change from Gen I to Gen II from an exterior standpoint is that the car's just got a lot more attitude. We spent 340 hours in the wind tunnel, validating and tuning the exterior surface like you might tune a guitar, dialing in the notes just perfectly so they sound right. There is this hint of something beautiful and functional about the car's new shape. We made the next-generation Volt more dynamic and more gestured. It's eco with an attitude.

*What interior enhancements have you designed into the vehicle?*

We added richer materials throughout the interior, so it's more sculpted, swept and has a lot more movement. We also made the controls more intuitive and added advanced phone integration technology. Apple CarPlay<sup>TM3</sup> compatibility allows you to conveniently access select iPhone® apps on the Chevrolet MyLink touch-screen.<sup>4</sup> And new for 2017, we will provide Android Auto<sup>TM3</sup> compatibility, so you can access select phone apps in a smart, simple way. Chevrolet design has evolved through the years and we're looking at things totally differently. We're taking some risks along the way, but that's what makes life exciting.



<sup>1</sup> EPA-estimated 53-mile EV range based on 106 MPGe combined city/highway (electric); 367-mile extended range based on 42 MPG combined city/highway (gas). Actual range varies with conditions. <sup>2</sup> Comparison to the initial 2011 Volt battery cell. <sup>3</sup> Vehicle user interfaces are products of Apple and Google and their terms and privacy statements apply. Requires compatible smartphone and data plan rates apply. Android Auto is a trademark of Google Inc. <sup>4</sup> Full functionality requires compatible Bluetooth and smartphone, and USB connectivity for some devices.



# Your Say...

## READERS' THOUGHTS ON PAST ISSUES

### Scheme of the Month

RE: OTY contenders. This is not a challenge to whom I think the winners are. I think it is obvious you will drive more vehicles in a month than the average reader does in a lifetime.

I'm inquiring about the selection of contenders. It used to be simple; either an all-new design or significant change in design/function was required. Meaning just an engine option was not enough to allow a contender. That changed a couple years ago when you allowed an identical Ram 1500 (other than engine) to enter (and win) twice ("Red Alert!" February 2014). I understand that without the entry, the Ford Transit Connect won by default, and who wants a cargo van as the winner? *[There were three half-ton trucks, one heavy-duty truck, and four vans competing against the Ram 1500 in 2014. —Ed.]* Now this year the same was true with the Chevrolet Colorado ("Back in the Saddle Again," January 2016).

But my question is the cars. And this may not have changed the outcome, but I would have liked to see how it fared. There was a vehicle with a completely new suspension, new brakes, slightly revised design, a ground-breaking new engine never offered on a U.S.-made vehicle (or really anything outside of Italy), the first-ever carbon-fiber wheels, and so many other changes. Yet it was not even a contender. I ask about the 2016 GT350/350R from Ford. This is so much more differentiating it from last year's Mustang than the Colorado or Ram did from the previous year. So the absence seems a setup to justify your selection as COTY.

#### GREG ELTON VIA THE INTERNET

*The truck market has fewer players and longer product cycles, so the "rules" are relaxed a bit. But the other issue is the significance of the engine in the Colorado. Bringing a diesel engine into a new segment (as Ram did to the full-size*

### LETTER OF THE MONTH

#### Wishful Thinking

Former VW CEO Martin Winterkorn must surrender his golden parachute, pension, and any and all benefits and spend at least 10 years in a U.S. federal prison. His self-serving arrogance, if nothing else, belies his consciousness of guilt. A fiasco of this magnitude starts with the rotten head at the top. I digress; the real story *Motor Trend* should cover is how the students and faculty at West Virginia University discovered the illegal computer manipulation and went about proving it. This is a real-life David and Goliath story that deserves to be told in compelling detail.

#### FRANK ORIENTER ROCHESTER, NEW YORK

*Believe us, the VW emissions scandal and our coverage is far from over. Unfortunately, we're not quite ridiculously good-looking enough to make the on-screen cut for the future Leonardo DiCaprio-backed docudrama. —Ed.*

*market and Colorado did to midsize) is a very big deal for the truck industry; greater impact, relatively speaking, than a limited-edition sports variant to the sports coupe market. That said, we do expect it'll be invited to 2016 Best Driver's Car. —Ed.*

### Sound Standards

In reviewing the SUV of the Year article in the January 2016 issue, I am curious why "the eye-watering \$63K" Lincoln MKX is worthy of your comment that it is "a lot to ask for a derivative" of the \$29K Ford Edge when I never see a similar observation that a \$95K Cadillac Escalade is "a lot to ask for a derivative" of a \$48K Chevy Tahoe LS? Or a \$98K Lexus LX 570 is "a lot to ask for a derivative"

of the \$46K Toyota Sequoia? *[The appropriate relation is the \$85K Toyota Land Cruiser; see page 82. —Ed.]*

#### MARTIN CLARK HOUSTON, TEXAS

*Cadillac has spent years earning back a reasonable chunk of its long-ago "Standard of the World" reputation while Lincoln has dithered. Likewise for Lexus. We'll stop commenting when Lincoln earns it, too; it's only recently begun heading down this current but largely promising path. —Ed.*

### "Normal"

In the "Garage" section regarding your long-term fleet of the January 2016 issue, it is reported that the '15 Chevrolet Corvette Stingray has a "creaky" targa. My '15 Stingray also has the same problem behind the passenger's head. Chevy initially tried lubrication, and after it didn't alleviate the problem, they replaced two strikers and a pin. That didn't work, either.

Since then, Chevy has essentially thrown up their hands and told me the situation is normal and I have to live with it. Please let me know when you find a solution because the condition is really irritating. GM has no interest in solving this.

#### ALAN BASKIND FRANKLIN LAKES, NEW JERSEY

*If we can somehow convince the dealer the creaking is not normal (Jedi mind trick?), we'll tell you all about the solution. —Ed.*

### Trophy Ready

Just read the "Tracking the Award" article in the January 2016 edition and realized that the statement under 1985 about the VW GTI being the first import-badged, American-built car to win COTY is incorrect. In 1983, the COTY was the Renault Alliance, which was an import-badged car, built by American Motors Corp in their Kenosha, Wisconsin, plant. AMC even brought out a special Alliance "MT" version that year to commemorate the award. I owned one.

#### STERLING HAHER READING, PENNSYLVANIA

*We have no excuse for forgetting this unforgettable gem. —Ed.*

This issue's article, "Tracking the Award," was an informative retrospect on the trophy and the cars that won it (January 2016). However, there is some incorrect archive data for 1961.

Indeed, the 1961 Pontiac Tempest was a continuation of GM innovation in drive-





## OBSERVATION OF THE MONTH

**"I've noticed MT becoming snobbier."**

train design and marketing that started with the 1960 Chevrolet Corvair's rear-mounted flat-six engine. However, the engine in the '61 Tempest was a longitudinal split of Pontiac's 389 V-8 yielding a four-cylinder engine—not the aluminum V-8 that was the engine of choice for the Oldsmobile F-85. It was the Pontiac four-cylinder that was connected via a torque tube to the rear-mounted transmission. On *Motor Trend's* recommendation as Car of the Year, I purchased a new Bristol Blue 1961 Tempest sedan with an automatic transmission. Pontiac did get a 326 V-8 as an optional engine in 1963. In 1964, with a larger and much better looking design, Pontiac received the rest of the 389 V-8. With the GTO name, it became a classic.

The four-cylinder Tempest engine was economical and a good starter family car for me. However, the timing chain tensioner was a weak point in the engine, failing at 12,000 and 36,000 miles. The carburetor was prone to flooding year round, and the throttle linkage froze in Nebraska winters.

Now I am not as likely to run out and buy a

## READERS ON LOCATION

**CONCEIVABLE OUTCOME** Here sits **Noah**, reader **Dave Greving's** grandson. The narrative: "My grandson Noah seems to be saying, 'Grandpa, when can I have one of these?' But it makes me wonder if he'll even be driving anything in 15 years. Or if he'll even have to wait that long if the car will be driving him instead! I hope not, as I'm sure he'd miss the excitement of driving the car. (Maybe it will be his dad's 'Vette.) I guess only the future will tell." Or perhaps Noah is suggesting, "Poopie's coming."



first-year new car based on a COTY recommendation, but I still read *Motor Trend* every month.

**RON RADEKE**  
FORT WAYNE, INDIANA

*The Tempest's short-lived Pontiac Trophy 4 could have been swapped for the (similarly short-lived) aluminum 215 V-8. Both engines were detailed in our March 1961 issue. The exceedingly rare V-8 was out of the Tempest lineup by '63 and didn't receive much public attention back in the day. But bonus points to you for putting your money down on our endorsement.—Ed.*

## Oops

Unless I've completely lost my ability to see, I'd say the interior picture on page 27 ("Trend," January 2016) is not that of the Mercedes-Benz C450 AMG. Looks more like a ML63 perhaps? Let me get my glasses and get back to you.

**BLAIR PISCHAK**  
SASKATOON, SASKATCHEWAN, CANADA

Cancel that eye appointment, Blair, because you're correct. (A GLE-Class Coupe was mistakenly shown.)—Ed.

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Jay Lamm, founder and chief perp of the 24 Hours of LeMons, has described racing thusly:

"Going around and around in a circle is one of the stupidest things you can do." With that in mind, we present to you \$434,365 worth of *dumb*. These three cars, the Chevrolet Corvette Z06, Dodge Viper ACR, and Porsche GT3 RS, not only represent the current tip of the their respective companies' performance spears but are also the three fastest sorta/kinda normally priced supercars

we've ever tested. Around Laguna Seca at any rate. These three cars are special. Incredibly, undeniably, unyieldingly special. But as is always the case in any comparison test, one is better than the others. Get your "for the third time in as many months, I'm canceling my subscription" Haterade flowing because this comparo is under way.

Sangfroid, translated literally from French, means cold-blooded, but for us in America, it means cool, calm, and collected. While you can call Dodge's sharpest snake a great many



**Words** Jonny Lieberman  
**Photographs** Michael Shaffer

# TRACK DAY BROS

**A HARD LOOK AT THE THREE FASTEST  
CARS FOR LESS THAN \$1 MILLION**



## COMPARISON

things, the Viper hasn't earned a reputation as a car that possesses sangfroid. Nor is it subtle. No, the Viper ACR is the equivalent of a bright pink fire truck, sirens blaring, setting Times Square on fire. You simply cannot miss it or ignore it. Look at the splitter, those canards, the deep-dish diffuser, that uproarious wing! Race car for the street. You can tell just by looking. The bright yellow Z06 is almost stealth by comparison. Sure, the black wheels and trim pieces help make the car pop much more than yellow Corvettes past. But the ACR is so extremely extroverted that the Z06 may as well be a Chevy Spark. The purple Porsche, on the other hand, seems much more in step with what the SRT boys are up to. All you have to



do is compare wings. If subtlety's an art, these three are accountants. But if you think going very fast around a racetrack is, meet Renoir, Matisse, and Picasso.

Let's take a look at how these three brutes—good for a combined 1,795 horsepower—stack up subjectively. The Corvette is the least race-car car here, not just in terms of looks but also in terms of everyday livability. It's the

one you'll want for a long road trip. "Stepping between the ACR and Z06 is a lesson in the importance of ergonomics," Jason Cammisa says. "The Chevy feels as though it was actually engineered around the human body, and as such it's an absolute pleasure to drive. The 'Vette works with you to be smooth, comfortable, and fast, whereas the Viper's interior does everything to make you not trust the car, yourself, or anyone around you."

That's right, folks. The Viper is without question still a Viper. The steering wheel's in the wrong place, the throttle is where the brake pedal should be, the brakes are where the clutch normally sits, the AC doesn't exactly work, the big 8.4-liter V-10 sounds like it



**AIR FORCE** Despite what "Fast & Furious" has taught us, wings don't add horsepower. They do, however, provide downforce. Half a GT3 RS, or 1,500 pounds, in the case of the ACR.



Top 10 Around Laguna Seca	Powertrain	Power/Torque (hp/lb-ft)	Price as tested	MRLS lap time
2015 Porsche 918 Spyder	4.6L V-8/electric hybrid, AWD	887/944	\$956,675	1:29.89
2016 Dodge Viper ACR (track setup)	8.4L V-10, RWD	645/600	\$132,890	1:30.46
2014 McLaren P1	3.8L twin-turbo V-8/electric hybrid, RWD	904/664	\$1,150,000	1:30.71
2015 Porsche 918 Spyder	4.6L V-8/electric hybrid, AWD	887/944	\$956,675	1:30.97
2016 Chevrolet Corvette Z06 (Z07 pkg)	6.2L supercharged V-8, RWD	650/650	\$98,360	1:33.05
2016 Porsche 911 GT3 RS	4.0L flat-6, RWD	500/338	\$203,115	1:33.29
2014 SRT Viper TA	8.4L V-10, RWD	640/600	\$116,000	1:33.62
2013 Chevrolet Corvette ZR1	6.2L supercharged V-8, RWD	638/604	\$125,920	1:33.70
2013 SRT Viper GTS	8.4L V-10, RWD	640/600	\$141,990	1:34.23
2012 Chevrolet Corvette Z06	7.0L V-8, RWD	505/470	\$105,000	1:34.43

If going around a racetrack very fast is an art, meet Renoir, Matisse, and Picasso.







**FIRECRACKER** Jason Cammisa called the supercharged, 6.2-liter LT4 V-8 the best-sounding engine on Earth. He's not far off, you know. Also, 650 horsepower and 650 lb-ft of torque? Yes, please!

## "The Corvette feels as though it was engineered around the human body."

belongs in a tractor—everything you've come to know and love/hate. As for the Porsche, it's everything you love about the 991 911, including the air-conditioning, the leather, and the Alcantara. The carbon-fiber race buckets, however, are extremely stiff and low. Ingress and egress is not for the tall or the inflexible. Cammisa also says that whereas the Viper could use an extra 100 horsepower and the 'Vette perhaps 100 less, the GT3 RS is "smack in the Goldilocks just-right zone," both in terms of power and in terms of feeling like a race car. The Viper, as Cammisa says, "is a far better torture chamber than car." The ACR is much more like a race car than a street machine. On the other end of the spectrum, you'd never know the Z06 is a track assassin when just puttering around town. The GT3 RS has the proper mix of usable daily driver and asphalt assault weapon.

However, it's just not as good to drive as the regular flavor GT3 is. "The GT3's magical handling has somehow been deleted with the addition of the RS badge," Cammisa says. "Whereas the GT3 was perfectly neutral, the RS flings itself into corners ass first and then understeers through the rest of the turn." The GT3 RS felt like an old-school 911, specifically

the Widowmaker, i.e., the 996 GT2. Near the limit, the GT3 RS was an oversteering handful. A talented (amateur) driver friend of mine explained that on the same track he was faster in the GT3 than in the GT3 RS. I think that's going to be the case unless you're a professional. Even then, the RS is tricky. "It says a lot about the GT3 RS that it's the first and only car Randy's ever spun while hot lapping MRLS," Scott Evans says. "Not once but three times."

As for the Viper, it didn't spin. In fact, its athleticism amazed all of us. "It is, in a word, astonishing," Cammisa says. "The ACR drives like a Spec Miata powered by lightning." Evans goes further, noting the Viper's cold-blooded edge over its predecessors. "I've never before, nor would I ever have, driven a Viper like I drove this ACR," he says. "I could hot lap this car all day without scaring myself, and I'd never tire of it." In my mind, I'm still trying to figure out how much of the ACR's vast improvement over all other Vipers is due to trick Kumho tires, how much is from the new dampers, and how much from all the aero—supposedly 1,500 pounds is generated by the big wing at 150 mph. I don't think I'm a good enough driver to notice the aero, but I sure as Shinola noticed the tires. Unreal. The

ACR would not, seemingly could not, put a wheel wrong. To me, the ACR is about as well-behaved a road car as I've ever driven.

None of us could say the same about the Z06. "Street driving was severely colored by my track impressions," Evans says. "Even with all the safeties on, I was trepidatious when going hard on the throttle. I couldn't help but worry that the rear end would come around on me. I never thought I'd say this, but the Corvette people need to buy this Viper and figure out how they got the rear end nailed down." Cammisa, characteristically, was a tad harsher. "The Z06's livability evaporates on track, where it reveals itself to be a bit of a handling disgrace," he says. "The Z06 turns in just fine and then transitions to explosive mid-corner oversteer. This mother isn't happy until you're at full opposite lock, puckered to the point of Preparation H Code Red." Not only do I agree with Cammisa, but I also experienced that last part. At the exact time that I was lapping the Z06, it began drizzling. The water on the track exacerbated the Corvette's bad behavior. I'll never forget going down the corkscrew *passenger door first!* That means backward. My neck swiveled more than 100 degrees over my right shoulder as my hands started spinning



**FULL BOOST** This particular Z06 had problems back in July for Best Driver's Car. This time? Plenty of power. In fact, some might argue too much power. Others would never argue that.



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**FUNCTIONAL FORM** Although this certainly is not the most pleasing cutout we've ever seen, cubic meters of hot air from the front brakes get smartly vented out of the fenders.

## The little German with less power and less torque was the drag-strip king.

the wheel like I was opening a submarine hatch. Then, without warning, the 650-hp beast snapped 180 degrees, miraculously pointing in the proper direction. I kept her on the track, but my knuckles are still white.

In terms of instrumented testing, well, the results are not what you're expecting. See, American cars are supposed to be quick in a straight line, and Europeans are supposed to be the ones that can go around corners. Or at least that's what that British television show trained everyone to think. In reality, the little German with quite a bit less power (500 hp for the GT3 RS, 645 and 650 hp, respectively, for the Viper and Z06) and wads less torque (338 lb-ft versus 600 for the Dodge, 650 for the Chevy) was the king of the drag strip. The Porsche hit 60 mph in 3.0 blazing seconds before igniting the quarter mile in 11.1 seconds at 125.0 mph.

The Z06 hits 60 mph in 3.3 seconds before laying wood to the quarter in 11.4 seconds at 124.4 mph. The ACR—because of all its funky aero—is slower than other fifth-gen Vipers we've tested, hitting 60 mph in 3.5 seconds and running the quarter in 11.5 seconds at 127.3 mph. (The Viper TA hits 60 mph in 3.3 seconds and runs the quarter in 11.3 seconds at 129.3 mph.) Now check this out: The lightweight Porsche and its giant carbon-ceramic brakes can halt from 60 mph in 96 feet. That seems very good (and it is), but then you learn that the Z06 stops from the same speed in a remarkable 91 feet. Within a foot of the best we've ever tested, the automatic C7 Z06. Did I say best ever tested? Kidding! The ACR just shattered our braking record, stopping from 60 mph in a neck-snapping 87 feet. Why? The big carbon Brembos help, but so do the ultra-sticky Kumhos, as well as all that fancy aero.

The figure-eight results are as follows: 22.9 seconds for the Porsche, 22.6 for the Viper, and 22.3 for the Corvette. For all these tests the Viper was in Street mode. (Dodge also gave us another ACR set up in Track mode—different compression and rebound settings for the dampers, a larger front splitter, a larger rear diffuser, and a different angle on the wing. That one, a blue Viper not pictured, ran a 22.3-second figure eight.)

The Z06 recorded maximum lateral grip of 1.17 g, the ACR pulled 1.14, and the GT3 RS managed 1.09.

Takeaways? The Porsche is ferociously quick, and the just-about-as-fleet Yanks are surprisingly evenly matched. Do any of these measurements have any bearing whatsoever on the racetrack? As it turns out, not really.

You should commit a few numbers to mind before we go any further. The first is 1:29.89.







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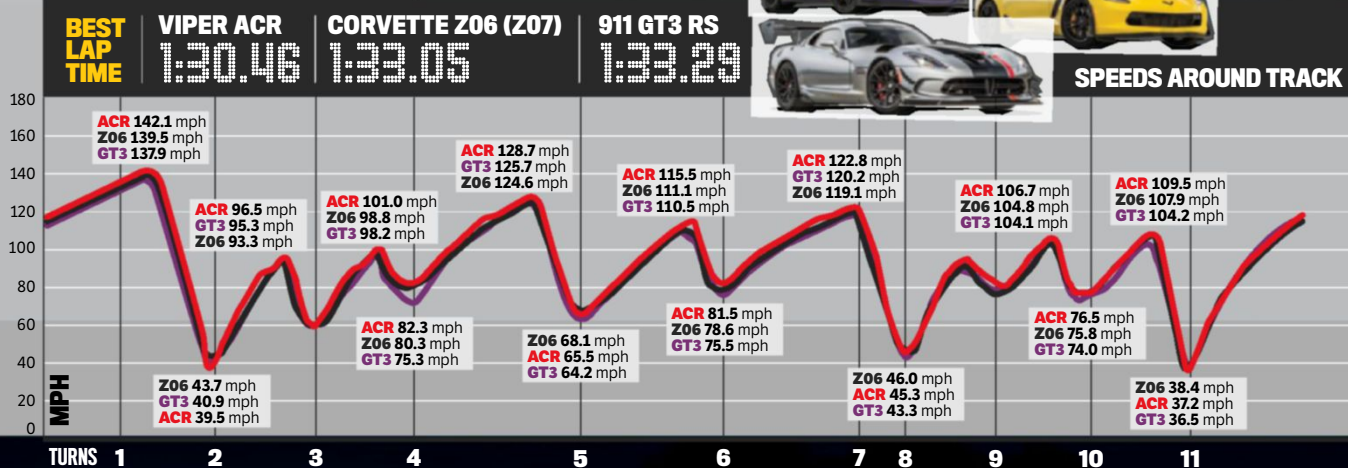
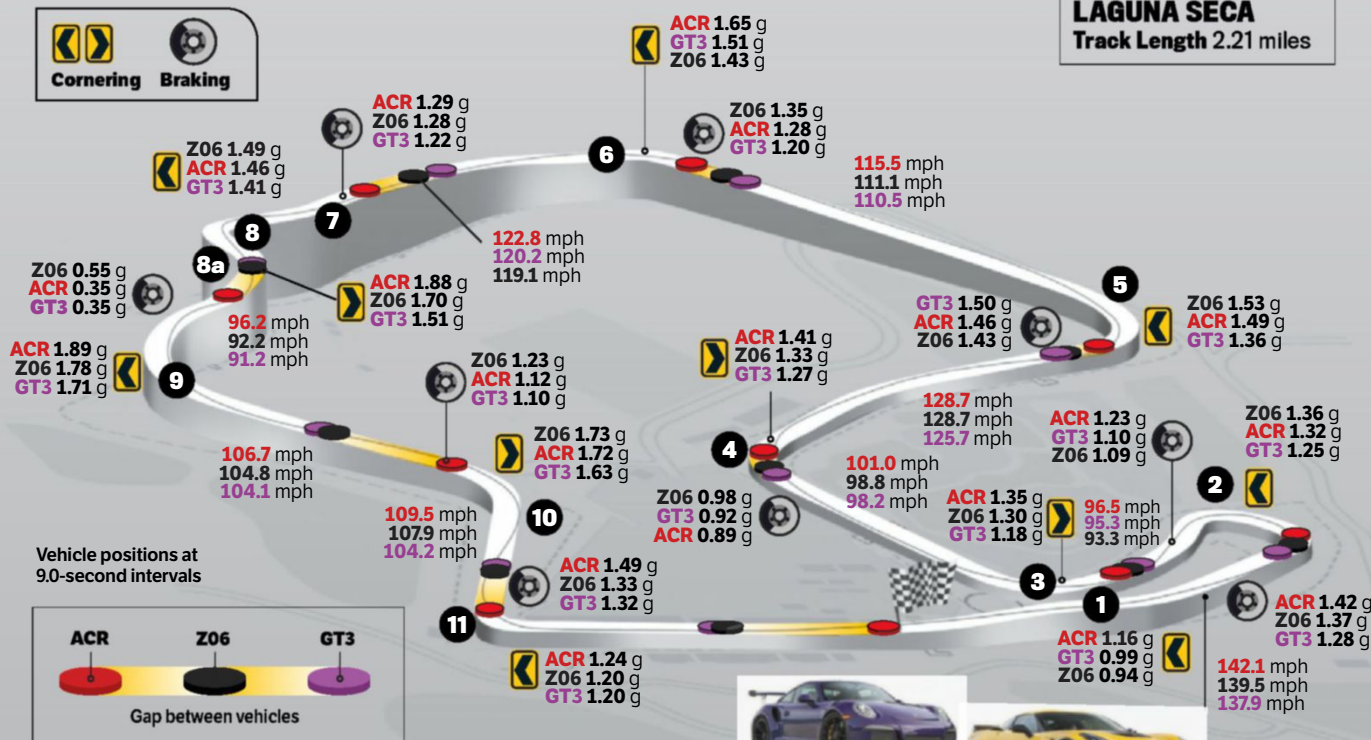
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# HOT LAP | Corvette Z06 VS. Viper ACR VS. 911 GT3 RS

**MAZDA RACEWAY  
LAGUNA SECA**  
Track Length 2.21 miles



## LAGUNA NOTEBOOK

Although the Viper ACR was the clear-cut victor, dominating in acceleration, top speed, and usually cornering grip, the Corvette still showed flashes of GPS-measured brilliance, and often the Porsche sparkled with subjective ones. The Viper nabbed every intermediate peak speed, but the Z06 had the best cornering grip in Turns 2, 5, 8, and 10 and even stopped better in 4, 6, 9, and 10. (The GT3 RS'

lone instance in the sun was stopping into Turn 5.) Through those corners, Pobst noted that the Corvette's "fundamental tendency is trailing throttle oversteer on corner entry, and in the lower gears, power oversteer, as well." Meanwhile, the GT3 RS "exhibits trailing-throttle oversteer all the way to the apex, rotating in very, very quickly. Then when you go to throttle, it understeers. It's like two different cars." About the Viper, Pobst said: "It hooked up all the way around, with a tendency to understeer through the middle of

the corner. It's actually difficult to spin the back tires under power." Nuances? "The Porsche has an extremely light feel entering a corner with extremely well-damped shocks, the best overall brake pedal feel, and a fantastic shifter (it's a little harsh on the 2-3 upshift); the Corvette and Viper's manuals seem old-school by comparison." Finally, he added, "The Z06's steering is super quick with brakes that are soft-feeling but powerful. The Viper is more of an 'on-rails' type of car, easy to drive fast." **Kim Reynolds**



**A SMOKE-FILLED FAREWELL**  
The Viper isn't long for our world, but fear not! Rumor has it that an all-new Viper is on the horizon, circa 2018.



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## COMPARISON



### SECOND Porsche 911 GT3 RS

A supremely capable track weapon. However, it's not as good as the regular GT3, and its features will not pay dividends in the hands of mere mortals.

### THIRD Chevrolet Corvette Z06

Now that it makes the power, the Z06 has to work on putting the power down. Until that time, it's simply not controllable enough.




The ACR is without question, doubt, or hesitation the best Viper ever made.



**BARREL CHESTED** The Viper's 8.4-liter V-10 has long been the largest production engine. It's nice to finally see it in a car that can make full use of all its charms.





**THAT'S A WRAP**  
As night falls on Mazda Raceway Laguna Seca, the car gods look down on what's been done and declare it good.

vehicles we've ever lapped around Mazda Raceway Laguna Seca. Truth be told, they're in the top six. Remember the number to beat? The Viper TA's time of 1:33.62? The Porsche GT3 RS smashed it, running the track's 2.21 miles in 1:33.29. That's an amazing accomplishment for a car with "only" 500 hp. The vehicle with the next-lowest horsepower in the top 10 is the C6 Z06 with 505 hp (but much more torque), which ran a 1:34.43. Bravo to Porsche; that's a hell of an accomplishment. Pobst wasn't 100 percent happy with how the GT3 RS was set up, however. He complained of too much understeer during maintenance throttle in the longer sweepers. He did praise the "super precise" steering and the shock damping, though. "Such control without harshness," he said. The Porsche was only third fastest.

The Z06, the same Corvette Racing Yellow guy that couldn't make boost at the 2015 Best Driver's Car competition, managed to pop off a 1:33.05. That's fast. Damn fast. And nearly six-tenths of a second faster than the Viper TA. Hat tip to Chevy. The sad part is that it could have gone faster. Here's Pobst as he exited the Z06: "Whew! Well, that's a wild ride, let me tell you." And here's some back and forth between us. Pobst: "The front is so hooked up that it turns well. It comes right down to the apex, and the rear can't keep up. There's entry oversteer, and I ran it in PTM 5." Lieberman: "You ran it in PTM 5?" Pobst: "PTM 5 because I want a safety net. Because it's not easy to catch the back of the car." Chevy needs to offer up a ZR1 or track-star special version of this car. Massive wing, more aggressive tires, more aero. Basically, Corvette needs an ACR.

Speaking of the ACR, Pobst danced the silver car, its electronics set to Track mode, around the track in 1:30.46, beating the Z06, the GT3 RS, and even the \$1.15 million McLaren P1, which ran a 1:30.71. True, he was nowhere near his 918 Spyder time, but as Pobst said, "God bless America, all 8.4 liters of it!" Pobst was positively beaming as he stepped out of the Viper. "It's such a great feeling to be able to take such a powerful car on track and it's hooked up!" he said. "And it's ... it's ... it handles better than the Porsche and the Corvette." The gathered peanut gallery exclaimed, "Wow!" To which Randy answered, "In every way! And it's usable. You don't have to be a pro to go fast in this car." I think you see where this is going.

Winner: the Dodge Viper ACR. The Porsche GT3 RS gets second place on the strength of doing more with less horsepower. The Chevrolet Corvette Z06 is impressively quick and is without doubt the friendliest and most livable car of these three on a daily basis. However, should you approach its limits, you will soon discover yours. Third place.

The Porsche and the Chevy have something in common. There are other versions of both the 911 and Corvette that we prefer—GT3 and Stingray, specifically. The ACR, on the other hand, is without question, doubt, or hesitation the best Viper ever made. ■

## Why Didn't I Go Faster?

I was struck by the wide gap in lap times between the Viper ACR lap record I set at Mazda Raceway with Dodge and the time I set for *Motor Trend*. The cars felt similar. It's not a power issue. Top speeds on the straights and acceleration curves were similar. Grip was down. I braked earlier and had a lower minimum speed in nearly every corner. I attribute the difference to the track condition. Our *MT* test followed a motorcycle weekend, and those skinny bike tires don't leave a nice layer of rubber the way race cars will. The track felt really green, as we say in racing. Perhaps it helps explain why the 'Vette Z06 felt so unruly. The Viper had that great stable balance, same as at the lap record run, and data showed good power, just less grip. I blame the track.

**Randy Pobst**

### FIRST Dodge Viper ACR

Ergonomically flawed but flawless on the race-track. A true legend that's capable of humbling million-dollar hypercars. Get 'em while they're still in production—the Viper goes away in 2017.

That's the amount of time it took Randy Pobst to lap a Porsche 918 Spyder at Laguna Seca during *Motor Trend* testing. The next number is 1:28.65. That's the track record Pobst set with the Viper ACR when Dodge hired him to validate its car on MRLS. The next number is 1:33.62. That's how fast Pobst lapped the Viper TA at MRLS during *Motor Trend* testing.

Obviously, we'd like to see the Z06 and the GT3 RS both beat the TA's time and Randy shatter his own record with the ACR.

Before you get your hopes up, know that conditions were not ideal. It was colder than we would have liked, the track was "green," and the rain that showed up midday didn't help. Still, these three cars are among the 10 quickest





POWERTRAIN/CHASSIS	2016 Chevrolet Corvette Z06 (Z07)	2016 Dodge Viper ACR	2016 Porsche 911 GT3 RS
DRIVETRAIN LAYOUT	Front-engine, RWD	Front-engine, RWD	Rear-engine, RWD
	Supercharged 90-deg V-8, alum block/heads	90-deg V-10, alum block/heads	Flat-6, alum block/heads
VALVETRAIN	OHV, 2 valves/cyl	OHV, 2 valves/cyl	DOHC, 4 valves/cyl
DISPLACEMENT	376.1 cu in/6,162cc	511.5 cu in/8,382cc	243.8 cu in/3,996cc
COMPRESSION RATIO	10.0:1	10.2:1	12.9:1
POWER (SAE NET)	650 hp @ 6,400 rpm*	645 hp @ 6,200 rpm	500 hp @ 8,250 rpm
TORQUE (SAE NET)	650 lb-ft @ 3,600 rpm*	600 lb-ft @ 5,000 rpm	338 lb-ft @ 6,250 rpm
REDLINE	6,500 rpm	6,400 rpm	8,800 rpm
WEIGHT TO POWER	5.4 lb/hp	5.2 lb/hp	6.5 lb/hp
TRANSMISSION	7-speed manual	6-speed manual	7-speed twin-clutch automatic
AXLE/FINAL-DRIVE RATIO	3.42:1/1.54:1	3.55:1/1.78:1	4.19:1/3.53:1
SUSPENSION, FRONT; REAR	Control arms, transverse leaf spring, adj shocks, anti-roll bar; multilink, transverse leaf spring, adj shocks, anti-roll bar	Control arms, coil springs, adj shocks, anti-roll bar; control arms, coil springs, adj shocks, anti-roll bar	Struts, coil springs, adj shocks, anti-roll bar; multilink, coil springs, adj shocks, anti-roll bar
STEERING RATIO	12.0-16.4:1	16.7:1	13.1-17.7:1; rear-steer +/-1.5 deg
TURNS LOCK-TO-LOCK	2.5	2.4	2.6
BRAKES, F; R	15.5-in vented, drilled, carbon-ceramic disc; 15.3-in vented, drilled, carbon-ceramic disc, ABS	15.4-in vented, drilled, carbon-ceramic disc; 14.2-in vented, drilled, carbon-ceramic disc, ABS	16.1-in vented, drilled, carbon-ceramic disc; 15.4-in vented, drilled, carbon-ceramic disc, ABS
WHEELS, F; R	10.0 x 19-in; 12.0 x 20-in, forged aluminum	11.0 x 19 in; 13.0 x 19 in, forged aluminum	9.0 x 20 in; 12.5 x 21 in, forged aluminum
TIRES, F; R	285/30R19 94Y; 335/25R20 99Y Michelin Pilot Sport Cup 2	295/25ZR19 90Y; 355/30ZR19 99Y Kumho Ecsta V720 ACR	265/35ZR20 99Y; 325/30ZR21 108Y Michelin Pilot Sport Cup 2 N1
DIMENSIONS			
WHEELBASE	106.7 in	98.8 in	96.7 in
TRACK, F/R	63.5/62.5 in	62.9/61.0 in	62.5/61.3 in
LENGTH X WIDTH X HEIGHT	177.9 x 77.4 x 48.6 in	175.7 x 76.4 x 49.1 in	178.9 x 74.0 x 50.8 in
TURNING CIRCLE	37.7 ft	40.5 ft	36.4 ft
CURB WEIGHT	3,499 lb	3,368 lb	3,243 lb
WEIGHT DIST, F/R	51/49%	50/50%	39/61%
SEATING CAPACITY	2	2	2
HEADROOM	38.0 in	36.6 in	38.5 in
LEGROOM	43.0 in	42.7 in	42.7 in
SHOULDER ROOM	55.0 in	53.1 in	54.3 in
CARGO VOLUME	15.0 cu ft	14.7 cu ft	4.4 (fr), 9.2 (rr) cu ft
TEST DATA			
ACCELERATION TO MPH			
0-30	1.6 sec	1.6 sec	1.2 sec
0-40	2.1	2.3	1.6
0-50	2.7	2.9	2.2
0-60	3.3	3.5	3.0
0-70	4.2	4.4	3.8
0-80	5.0	5.2	4.7
0-90	6.0	6.1	5.8
0-100	7.4	7.4	7.0
PASSING, 45-65 MPH	1.4	1.4	1.4
QUARTER MILE	11.4 sec @ 124.4 mph	11.5 sec @ 127.3 mph	11.1 sec @ 125.0 mph
BRAKING, 60-0 MPH	91 ft	87 ft	96 ft
LATERAL ACCELERATION	1.17 g (avg)	1.14 g (avg)	1.09 g (avg)
MT FIGURE EIGHT	22.3 sec @ 1.06 g (avg)	22.6 sec @ 0.97 g (avg)	22.9 sec @ 0.92 g (avg)
2.21-MI ROAD COURSE LAP	93.05 sec	90.46 sec	93.29 sec
TOP-GEAR REVS @ 60 MPH	1,200 rpm	1,400 rpm	2,600 rpm
CONSUMER INFO			
BASE PRICE	\$91,385	\$123,390	\$180,195
PRICE AS TESTED	\$98,360	\$132,890	\$203,115
STABILITY/TRACTION CONTROL	Yes/Yes	Yes/Yes	Yes/Yes
AIRBAGS	Dual front, front side/head	Dual front, front side/head	Dual front, front side, front curtain
BASIC WARRANTY	3 yrs/36,000 miles	3 yrs/36,000 miles	4 yrs/50,000 miles
POWERTRAIN WARRANTY	5 yrs/60,000 miles	5 yrs/60,000 miles	4 yrs/50,000 miles
ROADSIDE ASSISTANCE	5 yrs/100,000 miles	5 yrs/100,000 miles	4 yrs/50,000 miles
FUEL CAPACITY	18.5 gal	16.0 gal	23.9 gal
EPA CITY/HWY/COMB ECON	15/22/18 mpg	12/21/15 mpg	14/20/16 mpg
ENERGY CONS, CITY/HWY	225/153 kW-hrs/100 miles	281/160 kW-hrs/100 miles	241/169 kW-hrs/100 miles
CO2 EMISSIONS, COMB	1.11 lb/mile	1.30 lb/mile	1.20 lb/mile
RECOMMENDED FUEL	Unleaded premium	Unleaded premium	Unleaded premium



THE CRAZY PART Sports cars, it seems, just keep getting better. Can you even imagine when we do this in the year 2020?



Audi

## Innovation, now seating seven.

With this much advanced technology inside, it was only fair to make room for everyone. Introducing the all-new Audi Q7 with a truly impressive array of innovations. The available Audi virtual cockpit with Google Earth™ navigation gives drivers control over the road from their own personalized command center. Leading-edge technology, such as available Audi turn assist, helps drivers avoid potential collisions by monitoring the road around them. Superior design and intelligence have come together to form the next-generation Sport Technology Vehicle.

**The all-new Audi Q7. A higher form of intelligence has arrived.**



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Sam Boyle is holding one gallon of regular-grade gasoline. The color of apple juice, it has the hydrocarbon content of 98 tons of buried prehistoric plant matter. It'll ping your credit card for about \$3 at our local Southern California prices. And after being combusted in a car engine, two of its 20 pounds of exhausted CO<sub>2</sub> will still be inhaled by your descendants—1,500 generations from now.

Only a few years ago we thought we were running out of gallons like the one Sam's holding. At a technology seminar I attended just five years ago, a nattily dressed oil expert clicked through a harrowing set of graphs. Its chilling climax predicted "Peak Oil"—the moment the world's production would top out, triggering violent price spikes as the oil market's elasticity suddenly snapped. We're doomed!

But we weren't! Prices did, yes, rise. Remember \$144 per barrel? Most large SUV buyers don't, apparently. Yet there was barely a peep in that presentation about the thing that's changed everything since: fracking. Although it was experimented with way back in 1947, it's only recently released a deluge of previously inaccessible "tight" shale crude (and environmental controversy), causing prices to collapse and the U.S. to become unexpectedly oil independent—and on the final day of 2015, an exporter again when a tanker of crude departed from Corpus Christi, Texas. A giant tributary to this Niagara-like price plunge has been Saudi Arabia's refusal to throttle its own production (hoping to run the frackers out of business). While Saudi Arabia has maintained a poker face, the game has brought the kingdom to within about five years of insolvency if prices stay below \$50 per barrel.

Today, Texas Light Sweet is at \$30.44. We shall see.

However, trusty Sam Boyle—who's still holding that beaker of gas (thanks, Sam)—really doesn't care about any of this. His job at our partner company, Emissions Analytics, is to narrowly but



**SUNSET OR SUNRISE?** While we'll be burning oil for quite some time, real-world testing such as our Real MPG is going to become crucially important.





# WHAT'S THE BEST WAY TO USE THIS GALLON OF GAS?

**THE WORLD'S TWO MOST EFFICIENT  
INTERNAL COMBUSTION CARS**  
AND THEIR COMPETING  
PATHS TO THE FUTURE

**Words** Kim Reynolds  
**Photographs** Robin Trajano



2016 CHEVROLET VOLT OR  
2016 TOYOTA PRIUS?



## COMPARISON

scientifically measure how far cars travel in the real world with that gallon. At this moment, he and his assistant, Jesus Flores, have tested a whopping 328 cars and trucks for our Real MPG program. Supported by a 15,000-gallon, chemically stable supply of regular, premium, and diesel grades from our partner, Chevron, the cars are instrumented with a \$150,000 gas analyzer and expertly lapped around a tedious 100-mile real-world course. Numbers are crunched and adjustments are made for traffic fluctuations, weather, and air-conditioner use, and once Emissions' London-based chief and statistician, Nick Molden, is satisfied, the results are added to our tally. While there's lots of buzz now about "real-world" testing in the wake of Dieselgate (in Europe, Renault has announced it will publish independent real-world results next to the government



**BIGGER JOLT** The Volt's new powertrain is a 1.5-liter engine with twin electric motors, two planetary gearsets, three clutches and a larger, 18.4-kW-hr battery.

scores)—we're already doing this testing. How opportune, then, that the two cars Sam is standing in front of—the all-new 2016 Volt and Prius—are making the biggest gallon-stretching claims out there. Sam may be their worst nightmare. As if they need nightmares.

The collapse of oil prices has fallen almost directly on the head of hybrid sales, their market share dropping 11 percent in 2015



**EVER BETTER** Per Argonne National Laboratory's Mike Duoba: "If your engineers keep at it, limitations of the power-split (hybrid) can be engineered out to get a pretty optimum system."

despite today's otherwise percolating car market. And it has left the rickety math behind hybrids' premium payback time (in the range of \$3,500 to \$4,600 for the popular ones) now pretty much kaput, too. Yet the revamped Volt and Prius aren't dead men walking. In fact, they may be precisely what you'll be driving in the not too distant future, regardless of how long those sheiks stick it out.

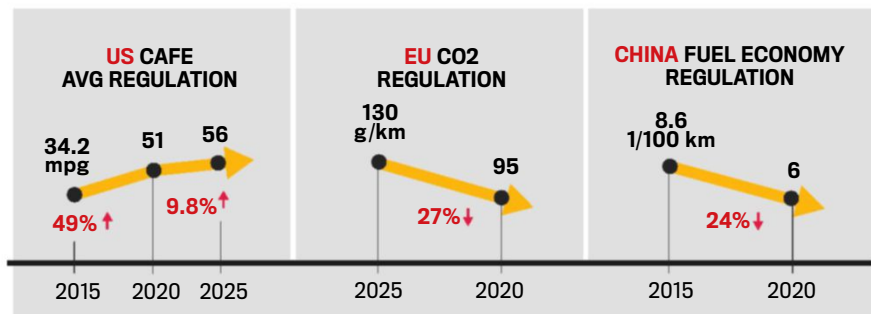


### MILEAGE MISERS

Externally, the Volt and Prius present similar packages, but their driving experiences and interior accommodations couldn't be more different.







#### AND HERE'S WHY:

Stare at these lines. They're going to be way more significant to the automobile's future than oil's spikes and plummets. And see that word regulation? The day after driving the new Kia Niro (an upcoming Prius and Volt competitor), I saw this slide during a presentation at Hyundai/Kia's fuel-cell research facility. On the left is a 49 percent squeeze in U.S. fleet fuel economy, in the middle, the EU's 27 percent noose-tightening on CO<sub>2</sub>, and on the right, China's 24 percent vice-handle turn on fuel consumption. All three by 2020, and backed-up by stiff penalties. Quicker than you'll say Adam Smith, the automotive market's invisible hand is about to hand a big chunk of its power to planet-spanning governmental edicts. And the only way to thread this needle—technologically—is with hybrids, plug-ins, and eventually battery-electric and fuel-cell cars.

Like it or not, drivetrains such as the Volt's and Prius'—the world's best examples of their respective breeds—are your future. Which

better uses our gallon of gas? OK, Sam, pour it in. As Jesus starts his runs, let's dissect the differences.

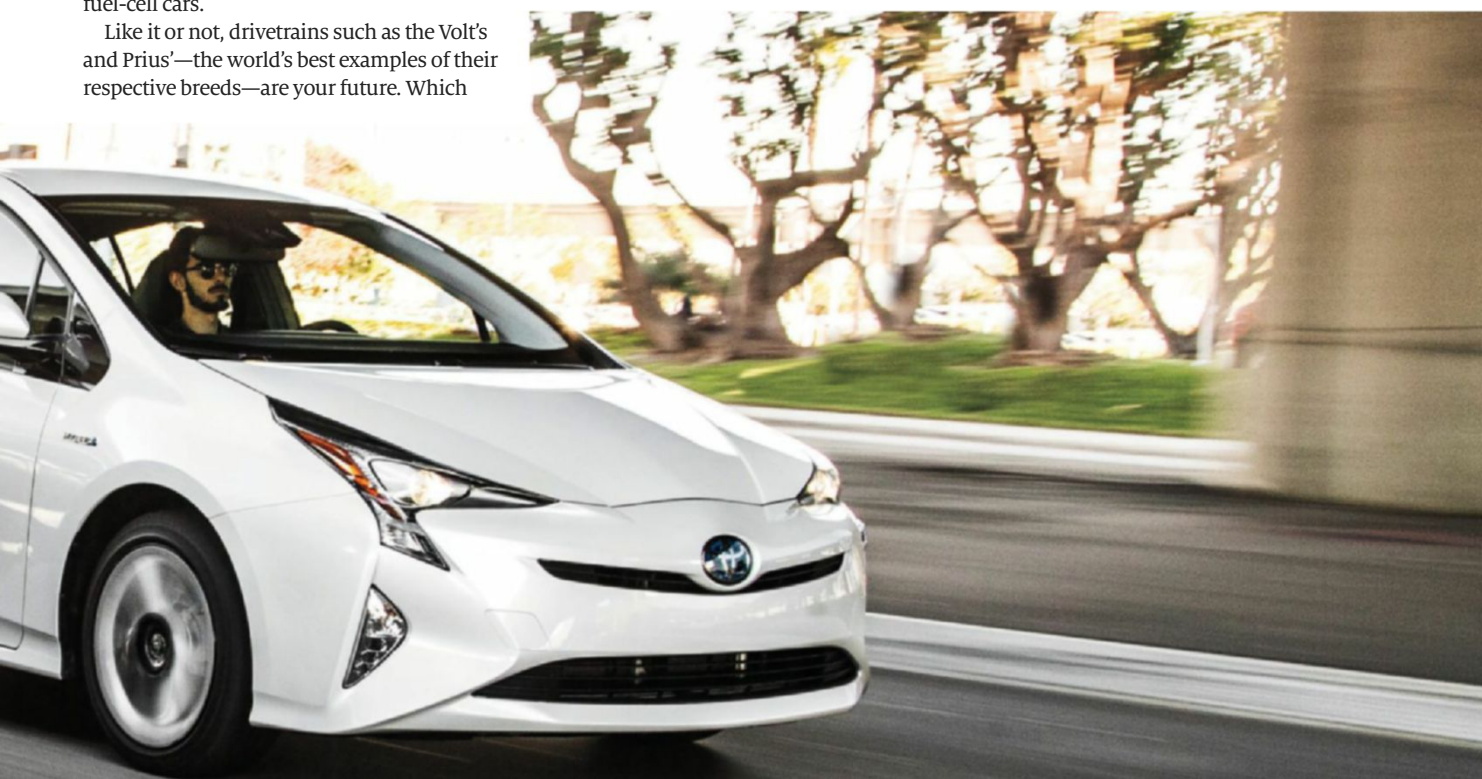
"This morning," Christian Seabaugh said before our subjective looping along the Palos Verdes Peninsula in southwestern Los Angeles County, "I had an odd encounter on a long, sweeping freeway on-ramp. There was a Challenger SRT8 on my tail [Oh, Christian ...]. I floored it and lost the Challenger [Oh, Christian!]. But once on the freeway, the Dodge pulled next to me and rolled down its passenger window. I expected a middle finger, but strangely enough, I got a thumbs-up." Perhaps the guy didn't recognize the Prius due to its psychedelic new styling.

But what's underneath that bodywork—the debut of Toyota's TNGA chassis—is transformative to the car's feel. As we tackled a twisty bit, I keyed the walkie-talkie. "This Prius feels

like a sports car ... err, wait. Am I really saying this?" Lord no, not an actual sports car. But its proper rear multilink suspension, lower center of gravity, and lighter weight (450 pounds less than the Volt) had me nipping apexes. Departing them, the tables turned as the Volt's electric motor(s) would surge it away with that notorious EV flood of hydraulic-like torque (fun). Both cars stopped with unpredictable brake feel (not fun), which in the Volt becomes sometimes scary in a sudden I-405 traffic thrombosis due to that extra tonnage. (Boy, that was close.)

The silver lining (nay, lithium lining) is that the Volt's battery inadvertently imparts great ride quality and quietness. At the same speeds in the Prius, you're twisting up the music's volume; meanwhile, the Volt feels like a very large sedan on a small sedan wheelbase—not a bad thing, actually, for A-to-B just getting there. Yet the Prius, for all its otherworldly technology, is still recognizably Toyota. "The more I drive this Prius," Christian said, "the less I love it and the more I 'like' it. It just leaves me feeling hollow."

Hollow is not a descriptor of the Volt's cabin. Its compromised battery packaging (put the damn thing under the floor!) is the Chevy's 600-pound gorilla—crammed into a 300-pound gorilla cage. "Man, is this back seat tight!" Seabaugh said as he mimed Twister into the second row. "I feel like I'm



The Chevrolet Volt and Toyota Prius may be precisely what you'll be driving in the not too distant future, regardless of how long those sheiks stick it out.





**“This Prius feels like a sports car ... err, wait. Am I really saying this?” Lord no.**

sitting in the back of a Camaro with the top of my head up against the back glass.” (For Christian, every unit of measure is computed via the international ponycar system.)

Oh, but our story began with Sam and his now-burned gallon of gas. So, Sam, which car sipped it better?

There's good news and there's bad news. His real-world Prius numbers clobbered the EPA's lab tests. Its city-cycle Real MPG of 56.5 mpg toppled the EPA's 54, its 53.4 on the

highway stomped EPA's 50, and our combined 55.1 walloped the EPA's 52. Wowee kazooee. That's 7 percent better on the highway and 6 percent better overall.

Bad news: The Volt did the opposite. Although it's a clear step ahead of its first-gen predecessor (tip of the hat), its Real MPG city number in charge-sustaining mode was a lowly 37.5 (compared to the EPA's 43). And although its highway score of 42.4 fractionally betters the EPA's 42, its combined result of 39.6 was short of the government's 42 (a 6 percent miss). Even its EV range ended at 49.9 miles versus the EPA's 53. What's up? Emails to London. Responded Nick Molden:

“While it's better on the highway, there's been no significant improvement on the city cycle. While the Chevy is comparatively immune to AC use and doesn't significantly suffer from aggressive driving, it's noticeably averse to congestion (as normal ICE vehicles are). Maybe it's why city driving performance is much lower than for the Prius.”

**ABOUT THE PRIUS:** “It has a quite different performance profile, and its very low fuel burn rate makes it more sensitive to AC use. Yet the Prius suffers virtually zero penalty in congestion, though it doesn't like being driven aggressively. I suspect its small battery size (now a tiny 0.75-kW-hr lithium-ion) can only boost the acceleration up to a point.”

All this triple-underlines why real-world testing is so important.

For a bigger-picture perspective, we spoke with John German of the International



**PLUG? OR NOT?** Conventional hybrids sometimes claim to be electric cars that charge themselves. It ain't so. In EV mode, the Volt is more efficient.



**BLEEDING EDGE** The Volt offers steering wheel levers for light braking and EV Hold mode, and both offer inductive phone charging.

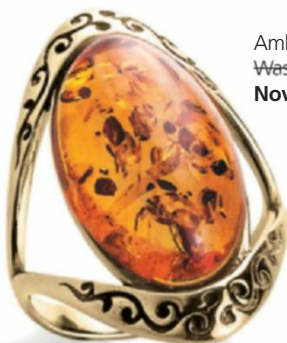


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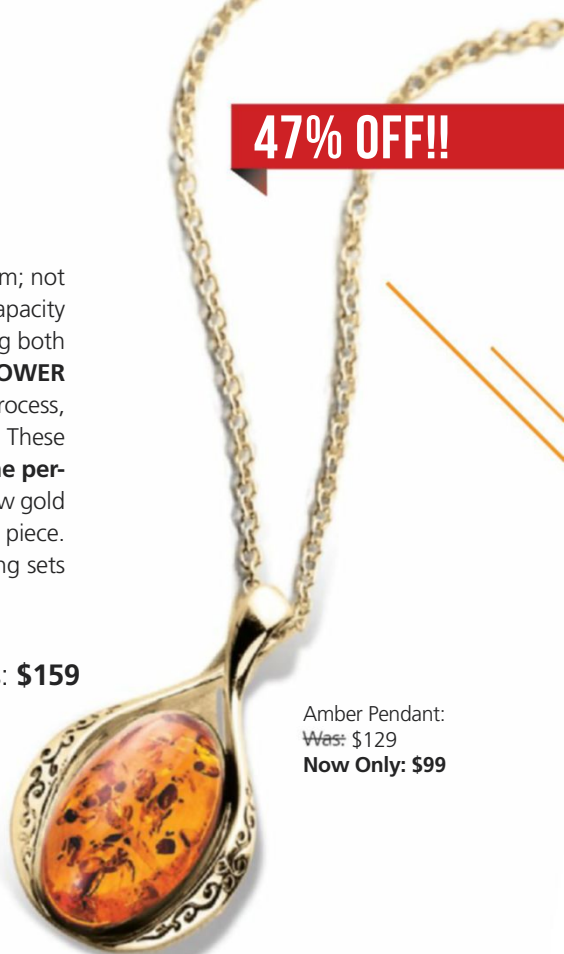
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**DANIEL STEIGER**





**HUV LUV** Hyundai's first dedicated hybrid arrives as a boxy package the automaker describes as a HUV-Hybrid Utility Vehicle.



## FIRST DRIVE 2017 Kia Niro Hybrid prototype



Just like that, the view ahead transformed into a brown-tinted blur. I looked around, puzzled. "Blows in from China," the Kia engineer said from the back seat. My god. It's what I'd imagine London looking like in Jack the Ripper's time. Except we were on the other side of the world, somewhere along South Korea's eastern seaboard.

"Smog from China, eh?" I slowly smiled—because I suddenly knew how this story would be starting.

"No," he replied. "Just dust the winds carry over sometimes."

"You sure?" I double-checked.

"Just dust," he said.

Nuts. I mean, driving into a Chinese smog bank would have been a helluva stage for this prototype of Kia's Niro hybrid I'm piloting. The Korean firm's first dedicated hybrid—what the Prius is to Toyota—the Niro is expected to achieve at least 50 mpg combined.

As we circled it during its static display, a pesky European journalist kept asking why the load floor isn't level when the rear seat is folded down. Think about it, dude. That dip is waiting to be leveled by lithium-ion batteries for the plug-in version coming later. (The Niro hybrid's 1.56-kW-hr, lithium-polymer battery nestles beneath the rear seat.) While we have that rear hatch open, you can see why Kia describes the Niro as a hybrid utility vehicle. It's a silly

name, but the two-box configuration does make practical sense; the car's boxy stern will comfortably swallow the plug-in's battery's inevitably inconvenient shape while remaining a happy cube of usable cargo space. Decidedly utilike compared to the new starship Prius (the Niro is taller by 2.3 inches, has an equal wheelbase, and is 7.2 inches shorter) the Niro's second row is proper 6-footer-scale. Up front, the Niro's dash is dull, dull, dull. But it's enlivened by some pretty cool software, such as a 3-D topographical map to predictively precharge its battery before hills (a first; it'll join a handful of others that do the opposite for descents). And how about a nav-map-based driver aid that tells you precisely when it's most efficient to lift off the throttle and coast into a corner?

On our hazy-day test drive, the throttle seemed even more instant-on than the Prius' (the Niro has twice the battery size) and handled

nimble if accompanied by more road noise than I liked. And a real surprise was the best-feeling regen brake pedal I've yet depressed. I mentioned this to that back-seat engineer, and he beamed; he was the guy responsible for it.

However, another driving quality caught my attention even more: the Niro's easy transitions between EV and internal combustion power. A couple of years ago, we were shown another brand's similarly powered prototype (off the record); it was so bad we handed back the keys and said, "Let us know when you're done with it." Terrible car.

Yet there are mounting examples that the architecture now synonymous with the word hybrid—the planetary transmission "power-split" type championed by Toyota—is finally being challenged by these things (referred to as P2s in the business). Understand, there's a broad variety of P2 schemes floating around (such as Audi's A3

e-tron and Volvo's upcoming three-cylinder turbo, both with DCTs), and the Niro's uses a new 105-hp, 1.6-liter GDI I-4 clutch-coupled to a 43-hp electric motor followed by a six-speed dual-clutch tranny. One trick is using a starter motor to fire the engine so it can be brought up to speed before closing the clutch.

John German of the International Council on Clean Transportation offered his perspective. "The Toyota/Ford's power-split hybrid is the most efficient hybrid design out there, but it's inherently expensive," he said. "The problem is the fixed torque split between the drivetrain and generator from the engine. For part-load operation you can bias the power by adjusting rpm, but for maximum power the generator must be oversized to handle the engine's power (plus a margin), and the traction motor is sized to handle the combined output of the generator and the battery pack (plus a margin). So you wind up with two very large motors.

"A P2 can get close to a power-split's efficiency—about 90 percent—during city driving, and you can match them on the highway," he said, "but at significantly lower cost, especially with a small, high-power lithium-ion battery, way tinier than its nickel-metal hydride alternative yet powerful enough to satisfy a hybrid's needs. The Achilles' heel of the P2, or parallel hybrids, is bump-starting the engine. Early systems that eliminated the torque converter didn't work well. But more sophisticated algorithms are changing things." And soon may make Prius-like mileage lots more affordable. **Kim Reynolds**



**ICONIC IONIQ** The Niro's corporate cousin, the Hyundai Ioniq, has gone with a Prius-like slinkiness. Hyundai predicts a full BEV version.



***CIVIC***

# 2016 NORTH AMERICAN CAR OF THE YEAR



**Your dreams drive us.**

This milestone of success belongs to you as much as it belongs to us. The all-new Civic has been named 2016 North American Car of the Year, and you are the inspiration behind this achievement.



Civic Touring Sedan shown. ©2016 American Honda Motor Co., Inc.



**THE EV CHOICE** The Volt is substantially quicker, über EV-responsive, quieter, and grips better. However, the Prius' lighter weight makes it much more agile.



Council on Clean Transportation. John's a hybrid-tech veteran and part of the team that unraveled the VW diesel cover-up. "The recent improvements on both the Prius and the Volt are completely consistent with that of each one's previous generation—and why I'm confident that hybrids will go mainstream sometime after 2020," German said. "According to the National Academy

of Sciences' 2013 report, "Transitions to Alternative Vehicles and Fuels," the cost of hybrids, BEVs, and fuel cell vehicles will converge in the 2030 to 2040 time-frame. However, PHEVs like the Volt will still have a substantial cost penalty due to its two expensive powertrain systems; hybrids will remain more expensive than conventional vehicles, but the cost premium might be

down to only \$600. With the average hybrid, including hybrid trucks, projected to achieve almost 100 mpg by 2050, putting its real-world fuel economy in the 60-70 mpg range, I have to ask: If your SUV is getting well over 50 mpg, are you really willing to pay a \$1,000 to \$2,000 premium to plug in for part of your driving?" So not only does the Volt trip on its mileage claims, but its drivetrain's long-term viability is doubtful, too.

Of course, we are in the here and now, riding toward those 2020 efficiency targets. Carmakers have no choice but to reach for



Even with all the dents the Volt has endured here, the best way to use that gallon is to ultimately not burn it at all.

plug-in hybrids. Which is the better here-and-now car then? Both Christian and I preferred the Volt. But if you need a back seat, it's useless. We both loved the Chevy's sense of EV torque—but do you have a charger at home to plug into? The Prius is simply the more significant car. In the big view, it's truly the car of the future, fully functioning today.

Ah, but I haven't answered our question about that gallon, have I? The well-to-wheel distance where the Prius and Volt have produced equal amounts of CO2 is a whopping 115 miles—beyond the length of virtually any daily trip. (Yes, I'm using California's almost extreme-case clean electrical generation, but it's far and away the largest plug-in market.) Up to 50 miles, the Volt produces only 56 percent of the super-efficient Prius' CO2 (the Volt having been in EV mode). And it hangs on to that advantage for another 65 miles until the Toyota overtakes it. Even with all the dents the Volt has endured here, the best way to use that gallon is to ultimately not burn it at all. ■



#### POWERTRAIN/CHASSIS

#### 2016 Chevrolet Volt

#### 2016 Toyota Prius

DRIVETRAIN LAYOUT	Front-engine, FWD	Front-engine, FWD
ENGINE TYPE	Atkinson-cycle I-4, alum block/head, plus AC electric motors	Atkinson-cycle I-4, alum block/head, plus AC electric motors
VALVETRAIN	DOHC, 4 valves/cyl	DOHC, 4 valves/cyl
DISPLACEMENT	90.9 cu in/1,490cc	109.7 cu in/1,797cc
COMPRESSION RATIO	12.5:1	13.0:1
BATTERY TYPE/CAPACITY	Lithium-ion/18.4 kW-hrs	Lithium-ion/0.75 kW-hrs
POWER (SAE NET)	149 (elec)/101 (gas)/149 (comb) hp	95 (gas)/71 (elec)/121 (comb) hp
TORQUE (SAE NET)	294 (elec)/103 (gas)/294 (comb) lb-ft	105 (gas)/120 (elec) lb-ft
REDLINE	5,600 rpm	Not indicated
WEIGHT TO POWER	23.7 lb/hp	25.5 lb/hp
TRANSMISSION	Cont variable auto	Cont variable auto
SUSPENSION, FRONT; REAR	Struts, coil springs, anti-roll bar; torsion beam, coil springs	Struts, coil springs, anti-roll bar; multilink, coil springs, anti-roll bar
STEERING RATIO	15.7:1	13.6:1
URNS LOCK-TO-LOCK	3.0	2.5
BRAKES, F; R	10.9-in vented disc; 10.4-in disc, ABS	10.0-in vented disc; 10.2-in disc, ABS
WHEELS	70 x 17-in, cast aluminum	70 x 17-in, cast aluminum
TIRES	215/50R17 91H M+S Michelin Energy Saver A/S	215/45R17 87V M+S Yokohama BluEarth S34
DIMENSIONS		
WHEELBASE	106.1 in	106.3 in
TRACK, F/R	60.6/61.8 in	59.4/59.8 in
LENGTH X WIDTH X HEIGHT	180.4 x 71.2 x 56.4 in	178.7 x 69.3 x 58.1 in
TURNING CIRCLE	36.4 ft	35.4 ft
CURB WEIGHT	3,532 lb	3,087 lb
WEIGHT DIST, F/R	60/40%	61/39%
SEATING CAPACITY	5	5
HEADROOM, F/R	37.8/35.8 in	39.4/37.4 in
LEGROOM, F/R	42.1/34.7 in	43.2/33.4 in
SHOULDER ROOM, F/R	56.5/53.2 in	55.0/53.0 in
CARGO VOLUME	10.6 cu ft	27.4 cu ft
TEST DATA		
ACCELERATION TO MPH		
0-30	2.3 sec	3.1 sec
0-40	3.6	4.9
0-50	5.3	7.1
0-60	7.5	9.7
0-70	10.3	13.4
0-80	14.2	18.8
PASSING, 45-65 MPH	4.4	5.4
QUARTER MILE	15.9 sec @ 83.9 mph	17.4 sec @ 77.6 mph
BRAKING, 60-0 MPH	119 ft	115 ft
LATERAL ACCELERATION	0.86 g (avg)	0.82 g (avg)
MT FIGURE EIGHT	26.9 sec @ 0.63 g (avg)	27.8 sec @ 0.61 g (avg)
CONSUMER INFO		
BASE PRICE	\$33,995	\$25,035
PRICE AS TESTED	\$40,470	\$30,835
STABILITY/TRACTION CONTROL	Yes/yes	Yes/yes
AIRBAGS	Dual front, f/r side, f/r curtain, front knee	Dual front, front side, f/r curtain, driver knee, passenger thigh
BASIC WARRANTY	3 yrs/36,000 miles	3 yrs/36,000 miles
POWERTRAIN WARRANTY	5 yrs/60,000 miles	5 yrs/60,000 miles
ROADSIDE ASSISTANCE	5 yrs/60,000 miles	3 yrs/unlimited miles
FUEL CAPACITY	8.9 gal	11.3 gal
EPA CITY/HWY/COMB ECON	113/99/106 mpg-e*; 43/42/42** mpg	54/50/52 mpg
ENERGY CONS, CITY/HWY	29/34*; 78/80** kW-hrs/100 miles	62/67 kW-hrs/100 miles
CO2 EMISSIONS, COMB	0.46 lb/mile**	0.37 lb/mile
REAL MPG, CITY/HWY/COMB	37.5/42.4/39.6 mpg**	56.5/53.4/55.1 mpg
RECOMMENDED FUEL	Unleaded regular, 110/220-volt electricity	Unleaded regular

\*Charge-depleting mode \*\*Charge-sustaining mode





# HOT METAL

THE WORLD CONVENES ON DETROIT FOR A FIRST LOOK AT WHAT'S TO COME

## TRUCK ROUNDUP



### Mind the Gap

## 2017 Honda Ridgeline



When we crowned the unibody Honda Ridgeline our 2006 Truck of the Year

based on innovations such as a two-way tailgate and an in-bed trunk, we heard an earful from readers questioning whether any front-drive-based vehicle could

ever qualify as a “real truck.” Sure enough, by 2011’s end, Toyota was selling 11 Tacomas for each Ridgeline Honda moved.

Now the midsize pickup segment is heating up, and Honda is rebooting the Ridgeline to catch this wave. The quasi flying buttresses are swapped for an

upright rear window, and there’s a rubber-filled body gap that your eye will perceive as a flex gap between the box and the cab. It’s pure *trompe l’oeil*—you’ll never see it flex on the hairiest frame-twister trail.

The tailgate still swings sideways or drops down, it still has an under-floor trunk compartment with drain

holes, and the pickup box is 4 inches wider and longer.

The Ridgeline still shares running gear with the Pilot, including its 3.5-liter V-6, six-speed auto, and a choice of front-drive or new intelligent torque-vectoring all-wheel drive. Trailer stability assist is also added to AWD models. Honda is targeting best-in-class acceleration, and we are assured that fuel economy will be best in class—if you exclude the Colorado diesel.

Can a rising tide of midsize pickup sales and “real-truck” styling cues boost Honda’s perennial single-digit market share? There’s a lot riding on that gap. **Frank Markus**





# Roomier Desert Runner 2017 Ford F-150 Raptor SuperCrew

A roomier SuperCrew model with a 12-inch-longer wheelbase (145 inches) will join the 2017 Raptor SuperCab. The additional length expands the rear cab area. All Raptors get a high-output, twin-turbo, 3.5-liter EcoBoost V-6 (rumored to make 450 hp) backed by a new 10-speed automatic transmission. A new on-demand four-wheel-drive system routes power between the front and rear axles under the direction of a six-mode terrain management system. A Torsen differential will be available for the front axle. **Jason Udy**



## Tough Mudder Nissan Titan Warrior concept

To amp up excitement around its new line of pickup trucks, Nissan stole a page out of Ford's Raptor playbook with its Titan Warrior concept. The Warrior keeps the Cummins 5.0-liter, turbodiesel V-8, wheelbase, and length of a 2016 Titan XD, but it grows in height by nearly 3 inches thanks to 37-inch off-road tires mounted on custom 18-inch alloy wheels. Width is up by 3 inches on each side to fit the wider tires and long-travel suspension. To give the look of modern armor, the Warrior wears a beefed-up grille, flared front and rear fenders, functional hood vents, custom front and rear LED lights, and a quad-tipped exhaust integrated into the rear bumper. **Megan Stewart**



## Midsize Jeep Pickup Is a Go 2017 Jeep Wrangler Pickup

Mike Manley, head of the Jeep brand, has confirmed what we've long suspected: A Wrangler-based midsize pickup will see production. Although Manley did not reveal any other details about the new truck, we do expect it to be a variant of the next-generation Wrangler due out in 2017. Look for Jeep to build all Wrangler variants at FCA's Toledo Assembly Complex in Ohio. Pictured to the right is a Mopar JK-8 pickup conversion kit for a 2007-2012 Wrangler. A clue of what's to come? **Stefan Ogbac**





## FAMILY CAR ROUNDUP

**ARE WE THERE?**  
Kid-friendly apps for the rear screens include one that turns Mom and Dad's boring nav-screen info into fun animated graphics.



## Wider, Sleeker, Cooler, With 80 MPG! 2017 Chrysler Pacifica



**The inventor of the modern minivan** has reinvented it again, rendering it too new

and cool for its 1940s-era name. Chrysler's design goal for this more West Coast-sounding Pacifica was to look cool enough that its owners don't feel like motoring martyrs.

Mission impossible? At least this from-scratch project had no legacy floor heights or windshield

touchdown points to work around, so the designers lowered the floor and the occupants, raked the windshield, and made it work with 20-inch wheels. Wheelbase and track widths increase, and the new van boasts almost 200 cubic feet of passenger and cargo space, up 10 cubes from before.

There's increased front-seat travel, optional eight-passenger seating, and improved Stow 'n Go



**If the SHO Fits ...**

## 2017 Ford Fusion Sport

**This mid-cycle refresh brings** detail refinements and upgrades, such as Sync 3, pre-collision assist with pedestrian detection, and adaptive cruise with stop-and-go, to Ford's big-selling family favorite. But the big news is the Sport model

with a 2.7-liter, twin-turbo EcoBoost V-6 good for a pink-slip-snagging 325 horses and 350 lb-ft of torque. That outmuscles even the 5.3-liter small-block V-8s that motivated the mid-naughties Chevy Impala SS and Pontiac Grand Prix GXP. Unlike the

V-8s, the new Fusion Sport distributes its abundant twist to all four wheels via a 6F55 six-speed auto.

Stiffer springs and anti-roll bars, variable-damping shocks, bigger brakes, and 19-inch wheels wrapped in aggressive 235/40R19 tires complete the Sport package. Sport models get a gloss-black

mesh grille and scooped fascia to cool the turbo intercooler, a decklid wing, and leather bolsters with Miko Suede inserts over more rigid, supportive foam. Sport models hit the road this summer starting at \$34,350. **Frank Markus**







**SUCKER** The retractable hose can reach the entire floor; an extension hose lets you tidy up your other car.



**TILT!** Amazing Stow 'n Go seats can tilt forward with a child seat installed and fold into smarter stowage wells sized and placed to accommodate AWD, and they're more comfortable.



seat comfort and functionality—they can now tilt forward for third-row access with a child seat installed, and switches let you power the front seats out of the way. The Pacifica even has a built-in vacuum.

Chrysler claims to have added 37 minivan firsts to the 78 it racked up in the first five generations. The biggest is an 80-mpg-e plug-in hybrid variant that pairs an Atkinson-cycle Pentastar V-6 with two electric motors via a Chrysler-patented planetary e-CVT

that lets both motors power the van in EV mode. Combined output is rated at 260 hp. Other firsts include all-aluminum sliding doors and an aluminum/magnesium rear hatch, all with hands-free power operation.

Mainstream 3.6-liters get new two-step valve lift intake camshafts, reduced friction, and an output bump to 287 horsepower and 262 lb-ft of torque, and it comes paired exclusively with a nine-speed automatic. Chrysler says we can expect this combo to deliver

class-leading performance and fuel economy. All-wheel drive may even be offered in the near future.

So whaddya think? Is it cool enough to pry you out of that high-floor, gas-thirsty, eight-passenger SUV you've never taken off-road? Check out the Pacifica in dealerships this spring. **Frank Markus**

## Cruzing for Cargo

# 2017 Chevrolet Cruze hatchback

### The first U.S. Chevrolet Cruze

hatchback will arrive on the compact scene following the 2016 model year debut of the completely redesigned Cruze sedan. Despite its swooping roofline, the new Cruze hatchback affords more cargo space than its sedan counterpart. Offered on just the top two trim levels (LT and Premier), the new

Cruze hatchback will be available with the latest infotainment and connectivity tech, including Apple CarPlay and Google Android Auto compatibility via MyLink, and active safety tech, such as lane keeping assist, rear cross-traffic alert, and blind-spot warning. An optional RS package features 18-inch alloy wheels and unique front and rear



fascias. Like the sedan, power will come from a direct-injected, 1.4-liter, turbocharged I-4 rated 153 hp and 177 lb-ft of torque. Power will be sent to the front wheels via a six-speed manual or a six-speed automatic.

**Jason Udy**





## Following the Avenir Buick Avista

The Buick Avista concept was a total surprise, but we're not complaining. With styling features inspired by the Avenir concept shown at last year's Detroit auto show, the Avista coupe is gorgeous and at the same time instantly recognizable as a Buick. The exterior looks relatively production-ready, though the interior is rich with flashy touches.

Perhaps more compelling than the Avista concept's styling is its bones. Buick says the Avista rides on General Motors' Alpha platform, which underpins the Cadillac ATS and the new Chevrolet Camaro. Powering the rear wheels is GM's new twin-turbo, 3.0-liter V-6 making 400 hp. **Erick Ayapana**



## An NSX-Powered Sedan?

# Acura Precision Concept

Acura is flexing its styling muscles with the Precision Concept, a long and wide sedan with suicide-style doors. Almost

as long as the Mercedes-Benz S-Class, the Precision has presence and is larger than Acura's current flagship sedan, the RLX.

Acura says the Precision is strictly a styling study to preview future design language. Still, its rear-drive proportions give the Precision a

premium look worthy of taking on the big German competitors. Also significant is the absence of Acura's signature beak-style grille, though that doesn't necessarily mean it's going away for good.

**Erick Ayapana**

## 373 Miles of Hydrogen Range Audi Q6 h-tron

Before introducing the h-tron Quattro concept, Audi CEO Rupert Stadler reiterated the automaker's commitment to resolve the emissions crisis affecting its diesel-powered models. He then said the ordeal serves as a "unique opportunity for change and innovation." Could hydrogen-powered vehicles such as the h-tron concept become a staple in Audi's lineup? Possibly.

Whether or not Audi moves forward with fuel-cell technology, the h-tron Quattro concept is likely a preview of an upcoming crossover set to debut in 2018. Audi says the new crossover will get an all-electric system with more than 300 miles of range, and we're guessing it'll be called Q6, slotting in between the upcoming Q5 and new Q7. **Erick Ayapana**







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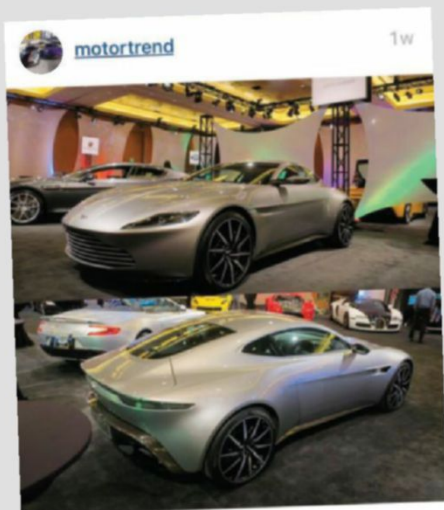
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We posted 40 pics and dozens of tweets from the North American International Auto Show. Here is what you liked best.

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Tweets...



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The star of The Gallery display of fancy cars at the MGM Grand during #NAIASDetroit was Bond's #AstonMartin DB10.



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#FalconMotorsports usually brings its latest F7 creation to The Gallery at #NAIASDetroit. This variant is powered by a #Lingenfelter naturally aspirated, 620-hp, 7.0-liter V-8.



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#Lingenfelter has developed its #Corvette Z06 packages on this Laguna Blue prototype. It's helping develop an 800-hp package.



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motortrend Your thoughts on the all-new @mercedesbenz #Eclass interior? @mbusa #allwhiteeverything #mercedesbenz

Which of the big Japanese brand reveals are you most looking forward to at @NAIASDetroit 2016?

Honda	33%
Nissan	39%
Toyota	28%

1,215 votes • Final results

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Best true concept from @NAIASDetroit 2016? Ready, steady, go!

Acura Precision	24%
Buick Avista	40%
KIA Telluride	6%
Nissan Titan Warrior	30%

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The #Precision concept is the future of @Acura design. How does it look?

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Looks dull!	22%
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It's hot	53%
It's ugly	22%
It'll grow on me	25%

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Favorite truck of @NAIASDetroit 2016? @Ford #Raptor vs @Honda #Ridgeline vs @NissanUSA #WarriorConcept #NAIAS2016

Ford Raptor	72%
Honda Ridgeline	10%
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## A Long-Overdue Lineup Filler 2016 Buick Envision

The Envision premieres an all-new premium D2XX platform. The midsize luxury crossover, sourced from the Chinese market, is an obvious addition to Buick's CUV lineup. Powered by a 252-hp, 2.0-liter turbo-four, the Envision comes standard with 19-inch wheels and engine stop-start tech. **Zach Gale**



## Subtle Touches 2016 Infiniti QX60

The 2016 Infiniti QX60 was the brand's second best-selling model in 2015, just a few thousand units behind the Q50 sedan. Changes to the refreshed 2016 QX60 are minimal. Infiniti engineers revised suspension and steering tuning for better response and handling. Redesigned engine mounts and three-layered acoustic glass for the side windows help to reduce noise. A new grille and added interior soft-touch materials round out the changes for the QX60. **Erick Ayapana**



## Can a Smaller Three-Row Crossover Remain a Strong Seller? 2017 GMC Acadia



The 2017 GMC Acadia makes its debut on all-new underpinnings. It rides on a wheelbase 6.4 inches shorter and is 7.2 inches shorter overall. Width and height decrease by 3.5 inches and 3.9 inches, respectively. With its smaller dimensions and additional lightweight high-strength steel, it's said to be 700 pounds lighter. That allows for a new base engine: a 194-hp, 190-lb-ft, 2.5-liter I-4 estimated to achieve 22/28 mpg city/highway. The more powerful 310-hp, 271-lb-ft, 3.6-liter V-6 should tow up to 4,000 pounds. A six-speed auto sends power to the front wheels—or all four with the available all-wheel drive. The outgoing full-size Acadia has three rows of seats, but the new midsize version is available with two or three. An off-road-oriented two-row All Terrain model is new. **Jason Udy**





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## M2-Powered All-Roader 2016 BMW X4 M40i

**The top-performing X4 gets a slightly detuned version of the M2's N55 3.0-liter, turbocharged I-6.** Here it's rated at 355 hp and 343 lb-ft of torque, and it comes paired to an eight-speed automatic. All-wheel drive is standard. BMW estimates that 0-60 comes in 4.7 seconds. An M-tuned suspension and chassis, larger brakes, and 20-inch alloy wheels round out the performance upgrades. **Jason Udy**



## Kia's new range-topping SUV? Kia Telluride Concept

**The Telluride Concept hints at a potential new range-topping SUV** for the Kia lineup. To create the Telluride, Kia took the Sorento's existing chassis and stretched the wheelbase by 11.9 inches. The model features a 3.5-liter V-6 and an electric motor for a combined total of 400 hp. Inside the cabin, sensors on the seat backs capture a driver's "vital health information," which shows up on screens mounted to the door panels. **Kelly Pleskot**



## Plug-in Off-Roader VW Tiguan GTE Active Concept

**This is a shorter-wheelbase, plug-in hybrid, off-road version of the new second-gen three-row Tiguan we will be getting.** Power comes from a 2.0-liter gasoline engine assisted by two electric motors for a total system output of 221 hp. A 12.4-kWh, lithium-ion battery pack provides up to 20 miles of electric driving range, after which the 16.9-gallon gas tank extends the range to an impressive 580 miles.

**Kelly Pleskot**





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## Spiritual Successor 2016 BMW M2

Following in the footsteps of the 2011 BMW 1M Coupe and the legendary BMW 2002 Turbo, the M2 promises exhilarating performance in a compact package. Power comes from a turbocharged, 3.0-liter I-6 making 365 hp and 343 lb-ft. An overboost function temporarily ups torque to 369 lb-ft. Transmission choices include a six-speed manual or a seven-speed dual-clutch gearbox. Upgraded suspension and brakes should make the new M2 a fun and capable ride. **Jason Udy**



## SLK + Face-Lift = SLC 2017 Mercedes SLC Roadster

A mild face-lift to the SLK adds resemblance to big brother SL's styling, and a name change brings it in line with Mercedes' naming scheme. The SLC300 replaces the SLK300 with the same 241-hp, 2.0-liter four-cylinder. The Mercedes-AMG SLC43 with a 362-hp, 3.0-liter, twin-turbo V-6 replaces the V-8-powered SLK55 AMG. Both use Mercedes' new nine-speed auto; acceleration should be brisk. **Jason Cammisa**



## Because It Needed More Power

## 2017 Porsche 911 Turbo

As if 520 hp (911 Turbo) and 560 hp (911 Turbo S) weren't enough, Porsche gave its most powerful 911s more oomph—now up to 540 hp in the Turbo and 580 in the S. Both soldier on with a boosted 3.8-liter flat-six; the Turbo gets modified intake ports, fresh fuel injectors, and increased fuel pressure; and the S sports revised turbochargers with a larger impeller. **Ron Kiino**



## 2017 VLF Automotive Force 1 Top Speed: 218 MPH

The Force 1 can hit 0-60 in just 3.0 seconds and reach a top speed of 218 mph, VLF Automotive says. Bold claims, considering the model is based on the Dodge Viper, but then again the L in VLF is the industry legend Bob Lutz. With a claimed 745 hp and 638 lb-ft of torque from the Viper-sourced 8.4-liter V-10, Lutz's claims are possible, but they come at a price: \$268,500. For that money, Force 1 delivers 21-inch wheels, LED headlights, and plenty of carbon fiber, aluminum,

and Alcantara selected and styled by the F in VLF, designer Henrik Fisker.

VLF Automotive's V, entrepreneur Gilbert Villarreal, will lead production, which starts in late April in Auburn Hills, Michigan. VLF isn't seeking large volume. "If we do close to 100 cars in 2016, we'll be very satisfied," Lutz says.

**Edward Loh**





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Dramatic meets aerodynamic in the all-new 2016 Prius. Its sleek design turns heads, but is nearly invisible to wind, with a drag-reducing active grille shutter, a built-in spoiler, lowered hood and more, creating a quieter cabin, more stable drive and an air-cheating .24 drag coefficient. The result is mpg that doesn't just defy expectations, it shatters them.







## Marking a New Chapter for the Brand 2017 Lincoln Continental

**Before you even step inside**, the new Continental aims to impress. Door handles are hidden on the bottom edge of the side windows, giving door panels a sleek look—a detail you won't find anywhere else in this segment. The car's welcome dynamics—gradually illuminating lights as you approach the car—should delight owners. So too will a twin-turbo V-6 producing about 400 hp, but this car isn't about power or sportiness. It's unapologetically luxury-focused with available active safety tech, front and rear seat massagers, and a self-parking feature. For luxury-sedan buyers willing to look beyond the Germans and Japanese, the Continental is more ready for consideration than any large Lincoln sedan has been in years. **Zach Gale**



## The Lexus Showstopper 2018 Lexus LC 500

**"Wait, that's NOT the concept?"** Lexus' wildly styled 468-hp LC 500 is a passionately styled two-door that targets exhilaration in every way—from the exterior styling and interior to what's under the hood and how the car drives. **Zach Gale**



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CHANDLER, AZ

**APRIL 2**

**RACE DAY 2**

TUCSON DRAGWAY  
TUCSON, AZ

**APRIL 3**

**RACE DAY 3**

WILD HORSE PASS  
MOTORSPORTS PARK  
CHANDLER, AZ







Q60

Q50

## Luxury and Sport Reborn

### 2017 Infiniti Q50/Q60

The refreshed 2016 Q50 sedan and the all-new 2017 Q60 coupe give Infiniti the attention-grabbing weapons it needs to take on the BMW 3 and 4 Series and the Lexus RC. Infiniti offers both the Q50 and Q60 with two versions of the automaker's new 3.0-liter, twin-turbo V-6, rated at 300 and 400 hp. A 208-hp, 2.0-liter turbo-four serves as a new base engine. **Erick Ayapana**



## The Equus Formerly Known as Hyundai

### 2017 Genesis G90



Please note the lack of "Hyundai" in this full-size luxury car's name. Genesis is now a brand in its own right, crafted out of thin air like the Acura, Infiniti, and Lexus names that came before it.

The G90 replaces the Hyundai Equus, and it's grown to compete directly in size against

the Mercedes-Benz S-Class. We look forward to learning whether a Hyundai has the clout to compete in the Mercedes marketplace.

The rear-drive, five-passenger sedan features two direct-injected engines—the familiar Tau 5.0-liter V-8 producing 420 hp or Hyundai's

first-ever twin-turbo, a 3.3-liter V-6 making approximately 365 hp. Both engines mate to an eight-speed auto; all-wheel drive is optional.

The Hyundai Genesis will be renamed the G80 and join the Genesis lineup, which should have six models by 2020. **Jason Cammisa**

## Goldilocks Knew a Thing or Two

### 2017 Mercedes E300



The E-Class brings us right back to Mercedes' golden years, when the company's small, medium, and large sedans were virtually indistinguishable from one another. Now like then, the three sedans eschew gaudy styling tricks for elegant design, and like back then, the E-Class is the best-looking of the three. The E-Class will initially be four-cylinder only. The familiar turbo 2.0-liter mates to the new nine-speed auto with rear- or all-wheel drive. We've heard the next model up will be the twin-turbo V-6 Mercedes-AMG E43. And it wouldn't be a modern E-Class without a V-8-powered E63, likely appearing next year with the 4.0-liter V-8 from the AMG GT. **Jason Cammisa**





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Words Frank Markus

# ENERGIZED BUNNY



**LOOK, MA, NO RANGE EXTENDER!**



Is 200 the magic number? Would that many miles of reliable electric driving range make you consider an electric vehicle as your daily driver? Chevy hopes so and as such has invested considerable effort into making sure the purely electric Bolt is a real car with a useful package and respectable ride and handling. Heck, Chevy even installed an SCCA racer, Josh Tavel, as chief engineer to make that happen. Did he and his bicontinental


team (most design and engineering were done in Korea, most development work in the U.S.) succeed?

To find out, I attended the production car's unveiling in Las Vegas at CES and got a chance to take a prototype Bolt for three hot laps of a closed course in a parking lot. There were no bumps, and the course's few jinks left and right didn't give too much opportunity to assess steering feel, body lean, and things of that sort. But the Bolt feels nimble with bunny-quick acceleration from a stop thanks

to the robust 200 hp and 260 lb-ft produced by the front-mounted electric motor. We are told the 0-60 dash will take less than 7 seconds and top speed is 91 mph.

Drop the shift lever into low "gear," and you get one-pedal driving with increasing regenerative braking (it can slow the car to a full stop) as you lift off the throttle. This is more relaxing than moving from gas to brake in stop-and-go driving. The degree of regen feels about right—considerably less than in the early Mini E but enough to keep





**DASHING** Take the longer, curvier road to grandma's house. The Chevrolet Bolt has 200-plus miles of range, a low center of gravity, and chassis tuning to SCCA racer tastes.

The purely electric Bolt is a real car with a useful package and respectable ride. It even has a racer as its chief engineer.

you from needing the brake pedal very often. More regen can be summoned by tugging the paddle on the left side of the wheel. The self-sealing 215/50R17 Michelin Energy Saver A/S tires seem to provide reasonable grip as low rolling resistance tires go, and the brake pedal feel seemed slightly better than average for such blended regen/friction systems.

Exact EPA energy use and range figures are not available yet, but we are assured the three-digit range number will start with a 2. The 60-kW-hr, liquid-cooled lithium-ion

battery pack developed with LG Chem weighs 960 pounds, and its 7.2-kW onboard charger can bring it to 80 percent of a full charge in 60 minutes with SAE Combo DC charging or a full charge in nine hours with a Level 2 charger. (It takes 50 hours with a 120-volt wall plug.) Designing the Bolt from scratch on a brand-new architecture presented great opportunities for integration of the electric equipment, such as designing an extra-long (for a B-class car) 102.4-inch wheelbase with







2017 Chevrolet Bolt

<b>BASE PRICE</b>	\$37,500 (est)*
<b>VEHICLE LAYOUT</b>	Front-engine, FWD, 5-pass, 4-door wagon
<b>MOTOR</b>	200-hp/260-lb-ft DC electric
<b>TRANSMISSION</b>	1-speed automatic
<b>CURB WEIGHT</b>	3,600 lb (mfr)
<b>WHEELBASE</b>	102.4 in
<b>L X W X H</b>	164.0 x 69.5 x 62.8 in
<b>0-60 MPH</b>	6.9 sec (mfr est)
<b>EPA CITY/HWY/COMB FUEL ECON</b>	Not yet rated
<b>ON SALE IN U.S.</b>	Fourth quarter 2016

\*Before federal and state tax incentives

GM's shortest front and rear overhangs to accommodate that big, low, flat battery pack as an integrated structural element. (The pack contributes 25 percent to the torsional stiffness of the car.) That's a luxury that's impossible when electrifying an existing gas car such as the Spark, but dedicated EVs present their own challenges. Routing the kinds of angled forces generated by the small-overlap crash test and its real-world equivalent through such a small overhang without a nice big lump of nearly solid metal to help distribute the load proved tricky. The electric motor is too small and low to be of much help, and the power controller mounted above it isn't massive or stiff enough, so an upper cradle and cross-car beam had to be developed to stabilize the front clip. Top Safety Pick status is expected.

Chevrolet is classifying the Bolt as a small station wagon, not as an SUV or hatchback. There's no AWD option, so SUV was out, and the way cargo volume is calculated for hatchbacks would have reduced the reported cargo volume behind the front seats to 56.6 cubic feet. At 94.4 cubic feet, its interior passenger volume is 2 cubic feet larger than that of a Nissan Leaf, though its cargo space behind the fold-flat 60/40-split second row is 6.7 cubic feet smaller. The Bolt's 16.9 cubic feet of cargo added to the passenger volume would have classified it as an EPA midsize car if not for the station wagon designation. The rear-seat roominess is made possible in

part by the (industry-first) ultra-slim front seats that involve a metal framework with a flexible plastic shell lined with a thin (0.4-0.6-inch thick) layer of foam. They provide ample support, and in my brief drive I felt no hard pressure points. And anyway, nobody will ever spend 10 hours at a stretch in these seats.

As we were in Las Vegas for CES, Chevy highlighted the Bolt's connectivity and infotainment features, which get displayed on a 10.2-inch center console screen, and another 8.0-inch screen serves as the instrument cluster. Both of them are reconfigurable. The inside rearview mirror is another screen,

fed by the standard backup camera on the rear hatch. It provides an 80-degree field of view that's always visible, even if passengers or cargo obscure the rear window. Flip what looks like the day/night lever on ordinary mirrors, and you get normal glass mirror—perfect if the hatch is open (or the camera breaks). There's also a 360-degree around-view displayed on the center-stack screen.

Seven devices can connect to the onboard Wi-Fi hot spot, and 10 Bluetooth phones can pair with the car. The driver's various infotainment, nav, climate, and other preferences are automatically loaded, but they're not keyed to a particular key fob. Rather, they're associated with the paired phone. Which phone? The first to be detected upon startup is assumed to be the driver's. If multiple phones are detected, the phone assigned the highest priority is selected. And Bluetooth low-energy senses the phone approaching and can unlock the car. Eventually, this could enable car sharing when the owner authorizes another user's phone, but for now the key must be present to drive off. There are many new EV-tailored functions enabled on the MyChevrolet mobile app, and Apple CarPlay and Android Auto are standard. Myriad content screens offer a multitude of eco-coaching and recording capabilities, and it will be possible to share these results with other EV owners to compete for top miles/kW-hr, energy regeneration, climate efficiency, etc.

The Bolt is scheduled to go on sale in the fourth quarter of 2016 at a net price (after a federal tax credit) of \$30,000. We'll have a more comprehensive drive this summer. ■



**DEEP OR FLAT** A movable floor panel will mount flat, even with the hatch opening and folded seats, providing hidden storage, or remove it for 16.9 cubes of space.





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Continental Super Sport All Season (2015)		3	97%	8.4	8.7	9.9	8.0	9.1	8.9	7.5	6.0	8.3	8.4
Continental Super Sport All Season (2015)		4	98%	8.6	8.8	8.9	8.1	8.5	8.5	7.7	6.9	5.7	8.1
Continental Super Sport All Season (2015)		5	99%	7.4	8.6	8.6	8.6	9.1	8.6	7.1	5.6	5.8	8.8
Continental Super Sport All Season (2015)		6	94%	7.0	8.6	8.7	8.4	8.8	8.4	7.6	6.4	6.2	8.0
Continental Super Sport All Season (2015)		7	94%	6.1	8.0	8.5	8.3	8.7	8.4	8.5	7.7	7.0	7.4
Continental Super Sport All Season (2015)		8	94%	7.8	8.3	8.6	8.8	9.0	8.7	8.6	5.3	5.6	8.5
Continental Super Sport All Season (2015)		9	90%	7.7	8.3	8.3	8.6	8.9	8.6	6.7	5.3	5.7	8.4
Continental Super Sport All Season (2015)		10	92%	6.7	8.0	8.1	8.6	8.8	8.6	7.1	6.2	6.1	8.0
Continental Super Sport All Season (2015)		11	90%	7.2	8.6	8.9	9.0	9.2	9.0	6.1	4.7	4.6	8.3
Continental Super Sport All Season (2015)		12	91%	8.8	8.8	8.8	8.8	9.0	8.9	6.0	4.6	4.7	8.0
Continental Super Sport All Season (2015)		13	88%	7.4	7.7	7.8	8.1	8.5	8.1	6.4	5.3	5.4	7.1
Continental Super Sport All Season (2015)													7.3
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**SUSPENSION**





# GO EVERY

**FIRST DRIVE** | 2016 Toyota Land Cruiser



**Words** Edward Loh **Photographs** Sinuhe Xavier and Edward Loh



"Brake hard. Don't swerve," our affable, efficient Toyota Australia rep says. "More people get hurt trying to avoid hitting a kangaroo than by the actual impact."

That's sound if not especially comforting

advice, seeing as the vast majority of SUVs on Australian roads have a heavy-duty front bumper. Our pristine, U.S.-spec Land Cruisers, however, are intentionally naked. Adding protection would block most of the external updates to the 2016 Land Cruiser: the new

double bubble hood, new bumper, and new three-bar grille. The only preventive countermeasure we're rocking is a giant magnetic bumper sticker slapped onto the back that reads, "CAUTION LEFT HAND DRIVE."

Why are we driving on the right side of the



# WHERE,

## CALIFORNIA-PLATED, OUTBACK-RATED

Toyota shipped three U.S.-spec 2016 Land Cruisers for us to take off-road in places such as the Flinders Ranges, South Australia's largest mountains. The Flinders span 265 miles and rise to an elevation of 3,842 feet.

# GOING NOWHERE

AN OUTBACK WALKABOUT  
IN TOYOTA'S FLAGSHIP





car but wrong side of the road and with eyes peeled for long-footed, leaf-eating leapers? Because Toyota determined the best way to showcase its refreshed über off-roader was through a whirlwind tour of the Australian Outback.

In addition to the front-end changes, the 200 series Land Cruiser gets new wheels, new taillight designs, chromier rear trim, and a nip and tuck to the back bumper. The most significant mechanical change is the all-new eight-speed automatic transmission replacing the six-speed. Inside, the most noticeable upgrades are the addition of dual 10-inch video monitors for the second-row passengers and an interior swathed in the same semi-aniline perforated leather boasting the supple texture, visible grain, and a protective, easy-to-clean finish found in many luxury cars. There are tons of small updates to the infotainment and safety/convenience systems, including enhanced iPhone connectivity, radar-assisted cruise control, auto high-beams, frontal collision avoidance, and rear cross traffic alert, along with a slick off-road turn assist for tight turns in the dirt, but more on that later. Features such as auto high-beams, rear cross traffic alert, and radar cruise control aren't new to the industry or even to Toyota; they're just new to Land Cruiser—and thus arrive fully baked. Everything works as promised and feels Toyota familiar.

On the highways outside of Port Augusta, South Australia, the eight-speed reveals itself to be a deliciously smooth operator; upshifts are so liquid you can easily lose count under normal acceleration or while pondering why the addition of two extra gears doesn't improve the EPA fuel economy one bit. Some of this has to do with the Land Cruiser's weight and massive capability. At 5,800 pounds, Toyota's three-row, eight-passenger flagship is large. With the carryover 5.7-liter V-8 that outputs 401 lb-ft of twist, it's also very much in charge—even when the roads start twisting—thanks to the Kinetic Dynamic Suspension System, which hydraulically adjusts the front and rear stabilizer bars for flatter cornering on-road and increased wheel articulation and traction when we hit dirt.

The pavement ends at Rawnsley Park Station, a sheep ranch turned eco-retreat, and the Land Cruiser's reason for being becomes apparent. Land Cruisers helped settle the Outback, starting with the very first 25 series in the 1950s and then the 40 series, which was the work vehicle of choice on remote stations (ranches) across the continent, in the '60s. The arrival of ute (truck) and wagon bodies along with diesel powerplants in the '70s vastly increased the Land Cruiser's range and utility. Nowadays, the preferred work vehicle for Australian miners and ranchers is the 70 series Land Cruiser turbodiesel.

Our gas-powered 200 series is significantly more plush than the utes and

steel-wheeled wagons that roam these badlands, but it's no less capable; a full-time four-wheel-drive system featuring a limited-slip differential with a 40/60 front-to-rear torque split and two-speed transfer case ensures that. The latter is becoming scarce in America's high-end SUV market as manufacturers realize how rarely owners employ low range or even know what it does.

Turning the Land Cruiser's center console-mounted dial to L4 (low range) not only engages a set of torque multiplying gears but also engages a passel of helpful off-road modes, including Toyota's Multi-terrain Select traction and camera system, Crawl Control, downhill assist, hill-start assist, and off-road turn assist.

As with the electronics, these off-road systems aren't based on any startling new technology; they primarily use sensors and software that monitor and control throttle



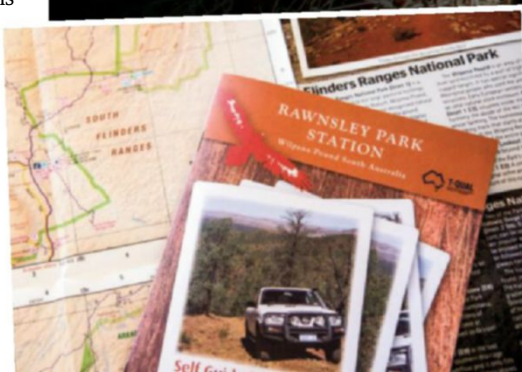
and brake to maximize traction or allow wheel slip depending on the situation. Systems like these can be found in other Toyotas and across the industry writ large, but the seamless way they operate speaks volumes about the thought and real-world R & D that has gone into the Land Cruiser.

In low range with the appropriate Multi-terrain Select modes engaged (there are five: Rock, Rock and Dirt, Mogul, Loose Rock, and Mud and Sand), the only causes for concern are obstacles that exceed the rig's dimensional limitations. Although armed with undercarriage skidplates, the Land Cruiser's modest



**CAUTION: VIDEO SHOOT** Producer Cory Lutz swallowed several flies and sweat through his Akubra to produce a ripper of a video. Search for "Land Cruiser" at [www.motortrend.com](http://www.motortrend.com).

**Our gas-powered Land Cruiser is significantly more plush than the utes and wagons that roam these badlands, but it's no less capable.**





## Gold Standard, Dark Shadow

**Quick, what do the Red Cross, the United Nations Security Council, and ISIS terrorists have in common?** A fondness for Land Cruisers.

It's true. White-painted Land Cruiser SUVs bearing red crosses and black U.N. letters are often seen in the background of the worst disasters and conflict zones around the world,



some of those disasters and conflicts caused by masked men waving black flags and AK-47s from the beds of Land Cruiser trucks.

Why the fixation with Toyotas, and how do they end up in the hands of terrorists? Well, to be clear, it's not all Toyota all the time for the terrorist set. For every one picture of a Kalashnikov-waving thug riding in the back of a 70 series truck, you can find another featuring 4x4s from Isuzu, Iveco, Mitsubishi, and Nissan. The difference is that Toyotas, especially Land Cruisers and Hilux trucks, are considered the gold standard for reliable transportation in the harshest environments.

Terrorists in Toyotas is also not a new development; back when the United Nations took on Somali warlords, coalition forces often faced "technicals"—light-duty pickup trucks, usually old Hiluxes and Land Cruisers, modified for combat with mounted machine guns,

rocket launchers, or sometimes just a bed full of armed insurgents.

But how do groups such as ISIS get their hands on so many seemingly new Toyota 4x4s? In response to a U.S. Department of Treasury Terror Financing Unit inquiry, Ed Lewis, a Toyota spokesman, said Toyota has a "strict policy to not sell vehicles to potential purchasers who may use or modify them for paramilitary or terrorist activities."

The short answer is that Toyota doesn't know, and it's cooperating with U.S. authorities to find out. As a spokesperson told us, supply chain integrity gets tricky in less developed parts of the world; even with 100 percent compliance on the part of Toyota dealers worldwide, motivated organizations can often buy whatever they want at auctions or through third parties.

Or they can just steal them. Because, well, they're terrorists.



**THE ROAD AHEAD** Crawl mode activates your choice of cameras and displays. At right, we ate Australia's coat of arms at the famous Prairie Hotel Parachilna.





## FIRST DRIVE

8.9 inches of ground clearance and 30-degree approach and 20-degree departure angles mean it is no longer capable of running hard-core spots such as the Rubicon without leaving paint and creased sheetmetal behind.

Our rig did make short work of the trails at Rawnsley Park and Willow Glen, a 300-acre off-road training center owned and operated by the Toyota Land Cruiser Club of Australia. We attacked steep hills on rutted trails in Rock and Dirt mode with low range engaged. As our rig nosed skyward, we pushed the Crawl button, which instantly slowed the Cruiser to one of five crawl speeds adjustable by the MTS dial. Feet off both pedals, we put our focus into steering around or over rocks and gullies. When we needed to stop, hill-start assist kept the Cruiser from rolling back when it was time to proceed forward. If we wanted to roll back, we used Crawl Control in reverse. Very handy.

A couple of times at Willow Glen, we encountered narrow cornering situations perfect for sampling off-road turn assist, which is activated by a button next to the MTS knob. Hit it, and it applies brake pressure to the rear wheel on the inside of the turn. This creates a rolling pivot point, similar to how a tank turns. Genius—if you ever need it.

All of these systems stood out on steep descents. Feeling body weight load up on seat belts as the view out of the windshield fills with rocks and ruts can be unnerving, but with all systems go, all we needed to do was find the best line while occasionally dialing our crawl speed up or down. There was no need to ride the brakes or goose the throttle when wheels became impinged; the Cruiser figured it out and provided audio updates via staccato pinging of the hydraulic solenoids rapidly clamping and unclamping individual brake calipers. If we wanted more information, we could cue up a video system called Multi-terrain Monitor,



HJ-47

## Utes, Mate, Utes

Toyota shipped us all the way to Australia for an extended test drive because the Outback is the spiritual home of the Land Cruiser—a fact driven home no matter where you look.

**This HJ-47** (circa late 1970s, early 1980s) spotted at a dock in Tasmania is an updated diesel-powered version of the FJ-45 trucks that helped build modern Australia.

**The spiritual successor** to the iconic 40 series Land Cruiser is the 70 series, which retains the boxy look and stripped-down utility. Sales of the 75 series tray-bodied utes began in the mid-'80s, and they can be seen at outback stations and urban work sites.

**"Troopy"** Land Cruisers date back to the earliest models when the rear bench seats faced each other. This 70 series-based custom model seats 17 in a traditional forward-facing arrangement.

**Australia's equivalent to an F-150** is called

the LC70 ute. Sold in five trim levels, from a single-cab, stripped-down "Workmate" cab-chassis to top spec GXL trim double cabs, they usually come with



a 4.5-liter, turbodiesel V-8 making 317 lb-ft of torque mated to a five-speed manual.

**The 80 series** was the most popular version sold in the U.S., but it was even more popular in Australia, where it received two gas and two diesel engines over its lifetime.



**The Prado line** of Land Cruiser started off as a lighter-duty version of the heavy-duty 70 series, targeted at SUV buyers who wanted off-road capability and comfort. Americans know the Prado as the Lexus GX series.



HJ-75



TROOPY

which provides nearly 360-degree views of what is going on, including at blind spots directly in front of and behind the truck. Combined with digital displays of pitch, roll angle, and wheel position, the whole show could be distracting.

If you'd like to opt out of the cameras, center armrest cooler box, or any other feature, you'd have to move (we recommend Australia, mate); in the U.S., Land Cruisers are mono-spec; they come fully loaded or not at all. Prospective owners only get to choose from five exterior and two leather colors, all for a starting price of \$84,820.

Sound like a lot of cash? It does if you're new to the Land Cruiser legend and look at its humble origins as a military truck. Prices have stepped upward in every generation over the nearly 60 years of U.S. sales, and the Land Cruiser is now the most expensive Toyota sold in America by nearly \$20,000. (A Platinum-grade Sequoia retails for just over \$65,000.) But for buyers who need eight seat belts, serious off-road capability that includes low range, and the ability to tow more than 8,000 pounds, the list of premium SUVs is short. (It includes platform-mate Lexus LX 570, which adds air suspension as the chief mechanical differentiator.

This improves ground clearance and approach and departure angles but reduces towing capacity and raises the sticker price to \$89,820.) Toyota sells about 2,800 Land Cruisers a year, most to repeat buyers, diehards who want the legendary quality, durability, reliability, and capability. The niche is small, but Land Cruiser isn't going anywhere. ■



PHOTOGRAPHS: WINSLOW WONG



## Going Nowhere.

In 2015, Toyota sold nearly 400,000 Camrys in nine configurations. Prius cleared more than 330,000 units and comes in 17 variations. By contrast, Toyota is lucky to move 3,000 mono-spec Land Cruisers a year. Even the pricier Lexus LX 570 sells more.

Although the Land Cruiser sits atop Toyota's price range and at the bottom of the sales chart, the company will likely never stop selling Land Cruisers in the U.S. Why? Because Land Cruiser is Toyota's oldest continuously sold marque in America. The Land Cruiser and Toyopet Crown sedan first went on sale at Toyota's first

U.S. headquarters in Hollywood, California, in 1958. The Crown was overpriced and ill-suited for the speeds of American highways and was pulled from the market in 1961, leaving Land Cruiser to soldier on alone until 1965. Although the solid-axled, two-door 4x4 with a three-speed column shift has evolved into a leather-swaddled

all-conditions people-mover over seven generations (depending on how you count), the Land Cruiser remains the clearest distillation of the characteristics that built Toyota's reputation in the U.S. and around the world. The loyalty it fostered demands loyalty in return, no matter the cost, so Toyota continues to invest in its flagship.



## (Almost) No Compromises

It's hyperbole to say that any vehicle is completely uncompromised. Every vehicle has to make concessions for such concerns as cost, safety, comfort, and fuel economy. But you can make a strong argument that with its off-road prowess and features, the Land Cruiser is the most capable and least compromised vehicle in Toyota's global lineup, and possibly the entire premium SUV segment.

If you disagree, consider the wheel size and third-row seating arrangement. Name another \$85,000 SUV that comes standard with 18-inch wheels and doesn't even offer a larger size as an option. Land Cruiser engineers don't care about bling; they're more interested in traction, ride comfort, durability, and safety during long hauls over rough terrain, and extra inches of sidewall help, especially if the tires are aired down.

As in the past three generations of Land Cruiser, stowing the third-row seats requires folding, splitting, and flipping the bench up, which blocks rear side windows and eats into

cargo space. Why not just have the bench tumble back neatly into the floor as in a minivan? Because you don't send minivans on U.N. aid missions. Directly under the floor of the third row is a full-size spare, just in case you get a flat 300 miles from the nearest cell tower. The space around it can be used for an 11.9-gallon supplementary fuel tank that boosts fuel capacity to 36.5 gallons. This was such a popular option that the extra tank was made standard for markets such as Australia, although it's common to see hardcore Cruiser heads relocate the full-size spare to a rear bumper carrier (often carrying two spare tires) and add an even larger supplementary fuel tank.

### 2016 Toyota Land Cruiser

BASE PRICE	\$84,820
VEHICLE LAYOUT	Front-engine, 4WD, 8-pass SUV
ENGINE	5.7L/381-hp/401-lb-ft DOHC 32-valve V-8
TRANSMISSIONS	8-speed automatic
CURB WEIGHT	5,800 lb (mfr)
WHEELBASE	112.2 in
L X W X H	194.9 x 77.9 x 74.0 in
0-60 MPH	6.8 sec (MT est)
EPA CITY/HWY/COMB FUEL ECON	13/18/15 mpg
ENERGY CONSUMPTION, CITY/HWY	259/187 kW-hrs/100 miles
CO2 EMISSIONS, COMB	1.31 lb/mile (est)
ON SALE IN U.S.	Currently







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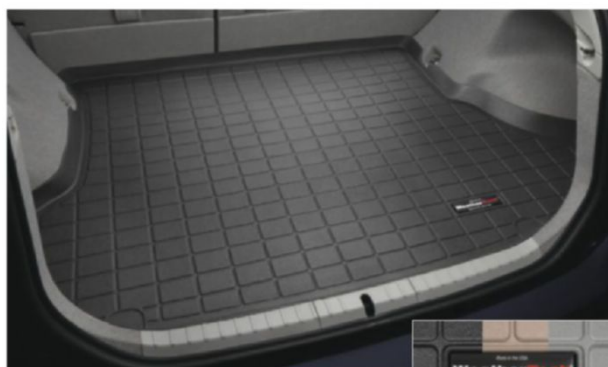
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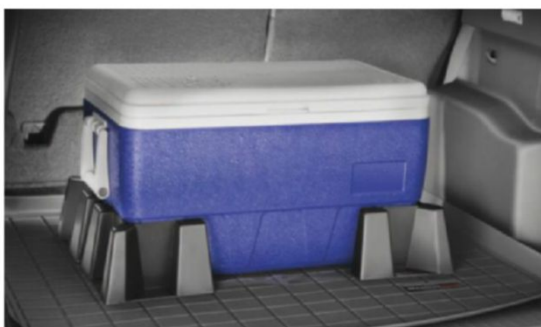
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TechLiner® and  
Tailgate shown

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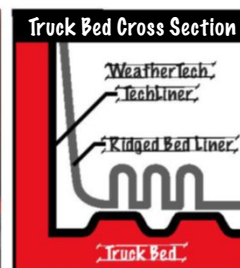
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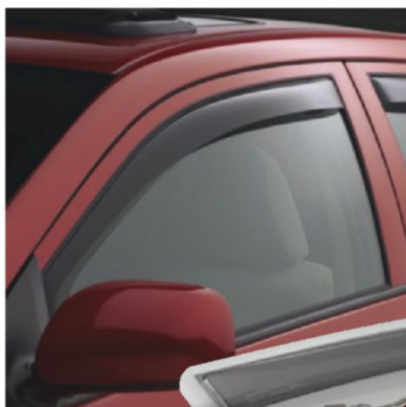
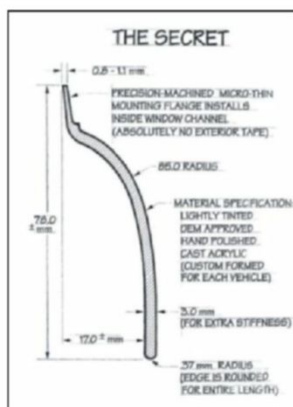
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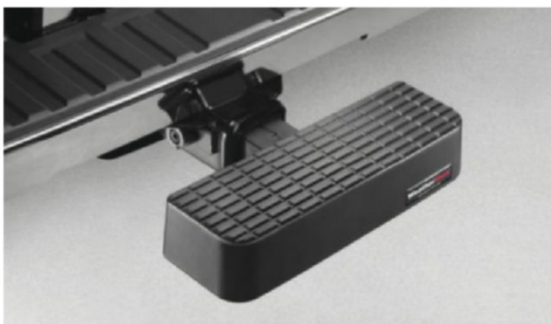
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# MOON SHOT

LIGHTS, CAMERA, ACTION! Although headlights are optional, taillights and rain lights are standard, as is a polycarbonate windshield with a wiper.

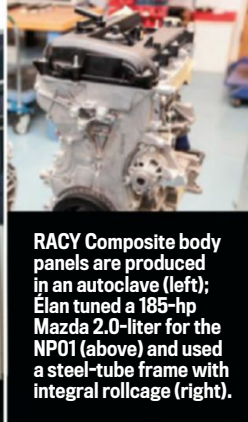


**THE OTHER NASA** BUILDS  
A LEGITIMATE SPEC RACER  
FROM THE GROUND UP

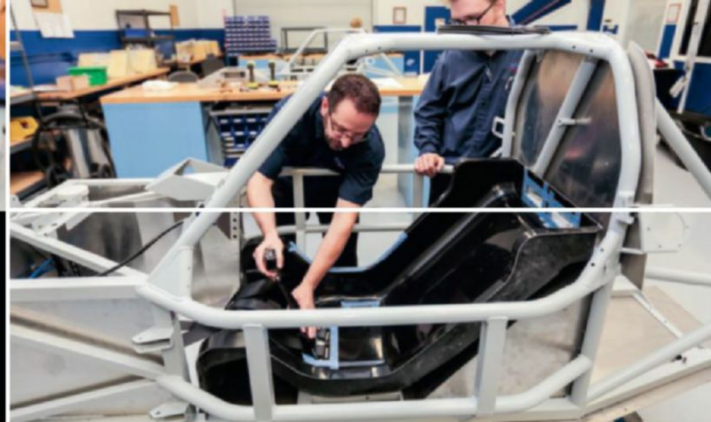
Words Randy Pobst







**RACY** Composite body panels are produced in an autoclave (left); Élan tuned a 185-hp Mazda 2.0-liter for the NP01 (above) and used a steel-tube frame with integral rollcage (right).



Red Bull reportedly spent almost half a billion dollars to run Formula 1 this year. A top IndyCar team spends about \$15 million. A Porsche 911 for FIA GT3 runs about half a mill, just for the car. You can make a small fortune in racing. Start with a large one. Stop the madness!

Enter the National Auto Sport Association (NASA) NP01, from Élan Motorsports Technologies, which also builds the IMSA Prototype Lites DP02 just 10 miles from my home near Road Atlanta. It was designed from the ground up for the highest possible ratio of speed to cost (it's \$72,500, with \$8,500 for optional assembly) and done in a sleek and hip prototype style with a closed cockpit. I know your little Spec Miata provides great racing, but this thing will blow it away, and you won't need to be really

secure with your masculinity.

Most single spec racing cars are open cockpit, but NASA chose a roof for its safety benefits. The tragic death of IndyCar great Justin Wilson illustrates the vulnerability of the open design, though such accidents are rare. And the bodywork enclosing the wheels eliminates the possibility of contact launching a car into the air the way open wheels can. These cars will share the track with much heavier street-based cars, too, making that full cage a great idea. For instance, a friend of mine was injured when he spun and a Mustang drove right up the sloped nose of his sports racer and bumper-tested his helmet.

The NP01 chassis has a straightforward steel tube tub, but the rear is pure prototype, a six-speed sequential gearbox doubling as the frame; the long rear control arms and rockers

bolt directly to it. Impressive at this price point. That trans alone accounts for a sizable portion of the price, and it's worth it. It lends track cred. For real.

Suspension uprights with Cadillac ATS bearings, OZ wheels, Toyo tires, and oversized StopTech brakes are the same on all four corners, and the composite body comes in nine replaceable pieces, removable in moments for service. Clearly, the designer has experienced thrashing to get a crashed car back on track within an hour. NASA put a tremendous effort into easy maintenance



**The NP01's rear is pure prototype. It lends track cred. For real.**





## The downforce makes the tires heroic above 100 mph.

and repair and carrying minimal spares. The object seems to have been a real race car with Spec Miata sit-in-the-shade-and-sip-a-cold-drink-between-sessions serviceability. There was a focus on running with a one-guy operation, club style.

The power comes from a ubiquitous Mazda four. Mazda was a natural, as it's already a NASA partner. It's got a near-stock 2.0-liter from the previous Miata, rated at 185 hp with dry-sump oiling. Hauling 800 pounds less makes the NP01 pretty quick, and that engine should last forever. It is prepped and sealed by Élan, and the engine package and rebuild costs seem a little pricey, but it helps keep the program afloat, I reckon. The units are tuned to within 1 percent power. I cannot help but glance over at the 2.5-liter in the Mazda6 and think it might go right in there. Zoom-zoom.

On track, power feels similar to that of a Formula Continental car with very much a spec feel to the engine. Mild but healthy midrange, a bit lazy near redline. The chassis is so composed that it reduces the sensation of speed, which actually does build quickly. Wheelspin is virtually nonexistent, and I miss

it. The sequential is a joy, and no, you don't need paddles, lazy boy, geez. How about a Powerglide and a cupholder? I used left-foot braking and a quick blip for downshifts, very race car. A big fan of StopTech, I'm not surprised the brakes felt just right.

Debriefing after my first 10-lap stint at the Buttonwillow circuit, I said I couldn't feel the limit of the Toyo RR tires and asked Brandon White from Élan about softening it up. He removed some spring preload and readjusted the ride heights in moments by popping off the bodywork. This would have been an all-morning affair on a Porsche Cup Car. Now I could feel the bite and got much more aggressive. The Toyos are a race-compound DOT tire and are very lightly loaded in this application, and it took two laps plus to get enough temp to grip up. A timid driver might never get them warm enough for maximum grip. After another 10 laps with this setup, I felt comfortable pushing the limits and came out of the car elated. It got my juices flowing. The racing drug, you know.

The MCS shocks are double adjustable, meaning for rebound and compression separately, so a lot of tuning is possible. I found a fair amount of mid-corner understeer and some trailing-throttle oversteer. Not at turn-in, which was quite stable, but later in the entry phase if I backed off on the throttle. (I know I'm not supposed to, but that's a tricky radius there.) Shock tweaks can certainly improve that and will be enjoyable for the racers who own the NP01. The cars are still

brand-new, and the NASA team, led by Jeremy Croiset, continues to refine the setup.

The aero is an interesting new factor for the sedan people. This prototype has real downforce. It changes the balance at higher speeds. In the banked fifth-gear sweeper they call Riverside, the rear wing was winning, manifesting some understeer, nice and stable but threatening to go agricultural to the outside if I dared go flat ... which I did not. On the bumpy straight following, I could feel the front floating a bit, implying the need for more front rebound, which may have helped the aero grip in Riverside by keeping the splitter closer to earth.

You can tell that the NP01 is a real race car. It responded nicely to the spring rate adjustment, a good sign. Once warmed, the Toyo RRs offer a very high grip-to-wear-to-cost ratio, a real benefit, and the downforce makes them heroic above 100 mph. Tires are often the largest part of a racing budget. The expectation is for these to remain competitive for three to four weekends.

An incredibly cheap, tunable, authentic, and good-looking race car that would be even better with a little more power. That's my one-line synopsis. I suggest to Jeremy that he get some 0-60 and quarter-mile times, maybe even the *Motor Trend* figure eight, to emphasize the performance because the excellent chassis actually de-emphasizes it. Then the real reward will come after the season when you go over expenditures and the love of your life does not threaten divorce. ■



### 2016 Élan NP01

BASE PRICE	\$81,000*
VEHICLE LAYOUT	Mid-engine, RWD, 1-pass, 2-door race car
ENGINE	Mazda 2.0L/185-hp/145-lb-ft DOHC 16-valve I-4
TRANSMISSION	Sadev S75 6-speed sequential manual
CURB WEIGHT	1,550 lb (est)
WHEELBASE	102.0 in
L X W X H	161.0 x 75.4 x 43.9 in
0-60 MPH	3.7 sec (MT est)
EPA CITY/HWY/COMB FUEL ECON	Not rated
ON SALE IN U.S.	Currently

\*Including \$8,500 optional assembly



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comp at \$99.99



**LOT 60343 67338 shown**  
**2 PIECE VEHICLE WHEEL DOLIES PITTSBURGH**  
**SAVE \$50**  
**\$49.99**  
comp at \$99.99



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comp





# GARAGE

Words Motor Trend Editors



## ARRIVAL 2016 Honda Pilot AWD Elite Scott Evans



**"We loved the Pilot at SUV of the Year, but will we still love it after 12 months of hard labor?"**  
@MT\_Evans

**EPA CITY/HWY/COMB FUEL ECON**  
19/26/22 MPG **BASE PRICE \$47,300**  
**PRICE AS TESTED \$47,300**

The old Pilot was, to be frank, quite old. Back when it was new, it was quite good, but even in 2011—two years after its debut—we dogged it for being out of date. I bring this up not to beat up on Honda or the Pilot but to set the stage for this new one. It's really new. So new that about the only thing it shares with its forebear is the number of rows and cylinders. And, you know, the name.

This new one's got a new everything. New platform, based on the excellent Acura MDX. New engine with more power and better fuel efficiency. New nine-speed automatic transmission option with new push-button shifter. New styling inside

and out. And not only is it all-new, but it's also all better. So much so that it was the clear runner-up in our SUV of the Year voting. This ain't your mother's Pilot, but for the next year, it's ours.

It doesn't hurt that our long-term tester is a loaded Elite model, a top-shelf trim level relatively new to the Honda brand. At \$47,300 as-tested, it might seem expensive, but the price is competitive with the rest of the segment. It's also worth noting the Pilot outperforms the class, something you'll appreciate when you're late to school or a youth soccer game.

Because no one at the office has a Quiverfull family, we didn't worry much about giving up the eighth seat for a pair of second-row captain's chairs. Such a compromise kept us in the Elite model rather than the Touring one step down, and those chairs are heated to boot. The front seats, meanwhile, are both heated and cooled.

Other Elite-exclusive features include a panoramic roof in the rear to complement the power moonroof up front, automatic LED headlights with automatic high-beams, rain-sensing wipers, and a blind-spot monitoring system. All of this is on top of the other features standard on the



Our Pilot Elite is loaded with all the gizmos you can get, but there are still far fewer buttons on the sleek new dash than before.



<b>UPDATE</b> AUDI S3	CHEVROLET CAMARO Z/28	CHEVROLET COLORADO Z71	CHEVROLET CORVETTE	CHEVROLET TAHOE LT	HONDA CR-V TOURING AWD	<b>ARRIVAL</b> HONDA PILOT AWD ELITE	KIA SEDONA
KIA SOUL EV+	LAND ROVER RANGE ROVER SPORT SC UPDATE	MERCEDES-BENZ CLA250 4MATIC	MITSUBISHI OUTLANDER SEL UPDATE	NISSAN MAXIMA SR	NISSAN MURANO UPDATE	RAM 1500 ECODIESEL	VOLKSWAGEN GTI

## RIDE ALONG FOR UPDATES ON OUR LONG-TERM FLEET

### SPECS 2016 Honda Pilot AWD Elite



**CO2 emissions** 0.90 lb/mi

**MT figure eight**  
27.5 sec @ 0.63 g (avg)

**6.2 sec**  
0-60 mph

**14.8 sec @ 93.9 mph**  
Quarter mile

**119 ft**  
Braking distance, 60-0 mph

**Vehicle Layout** Front-engine, AWD, 7-pass, 4-door SUV  
**Engine** 3.5L/280-hp/262-lb-ft SOHC 24-valve V-6  
**Transmission** 9-speed automatic  
**Lateral Acceleration** 0.80 g (avg)  
**Curb Weight (F/R dist)** 4,290 lb (56/44%)  
**Energy Cons, City/Hwy** 177/130 kW-hrs/100 miles



Elite and optional on lesser models. Those include the full Honda Sensing suite of driver aids with lane keeping assist, adaptive cruise control, collision mitigation, lane departure warning, and road departure mitigation, which create a semi-autonomous driving system under the right conditions. We're also fond of the 540-watt, 10-speaker stereo and many USB ports, power points, and cupholders.

With its sedanworthy comfort and performance, weather-beating all-wheel drive, and plenty of space for people and stuff, the Pilot will no doubt find many willing drivers during its tour of duty. The big question: Will we love it as much in 12 months?



After the A3 1.8T and A3 TDI versions, we saved the best for last: a 2016 Audi S3 2.0T Quattro Premium Plus. All A3s should be S3s.

### 2016 Audi S3 Chris Walton



**"Loving our new S3 Quattro S Tronic. It's a VW Golf R disguised as a plain old A3 sedan that runs a 4.4-sec 0-60 mph."**  
@Chapter\_34

**Service life** / 1 mo/1,673 mi  
**Avg CO2** / 0.80 lb/mi  
**Energy cons** / 139 kW-hrs/100 mi  
**Unresolved problems** / None  
**Maintenance cost** / \$0  
**Normal-wear cost** / \$0  
**Base price** / \$43,425  
**As tested** / \$49,950



**REAL MPG FUEL ECON** 24.3 MPG comb.

In our yearlong tour through the Audi A3 range, we first enjoyed a few months with an A3 1.8T Premium Plus, then dieseltgate emissions controversy abbreviated our stint with an A3 TDI Premium. Our final chapter, however, has brought a smile back: a 2016 Audi S3 2.0T Premium Plus. The base price is \$43,425, but before you spit your pilsner, remember that the S3 has the biggest punch of the littlest Audi sedans. The 2.0-liter, 292-horsepower engine—the same EA888 turbocharged inline-four from the VW Golf R hot hatch—propels the 3,420-pound four-door to 60 mph in just 4.4 seconds. That's faster than a Mustang GT. A smooth (when you want it) and quick-shifting two-mode six-speed double-clutch transmission sends power to all four wheels to make this feat possible.



Ever so thankful for two heated front seats on this chilly morning—and for the frost-warning indicator on the instrument panel.

The EPA rates the 2016 Audi S3 at 23/31/26 mpg city/highway/combined. Our in-house Real MPG lab returned slightly less efficient results with 20.3/32.0/24.3 mpg city/highway/combined. In everyday use, which includes an unusual amount of stop-and-go traffic, we're averaging 24-25 mpg, mirroring our lab's combined result.

Happily, we can report that all of our criticism of the A3 TDI's lazy power delivery and recalcitrant transmission programming are absent in the S3, and not just because this car has more power. With the drive mode in Automatic and the transmission in Drive, the S3 is smooth and docile with predictable acceleration and intuitive automatic gear changes in everyday driving. Selecting "S" with the shifter makes the transmission hold gears longer and summons aggressive matched-rev downshifts in preparation for a corner. Cool stuff.

We're really enjoying this, our final version of the A3 line. It's as if we saved the best for last. All A3s should be S3s.





## 2015 Land Rover Range Rover Sport SC Angus MacKenzie



**“When the mercury’s hovering in the teens, heated seats and a heated steering wheel become necessities rather than luxuries.” @Angus\_MacK**

**Service life** / 11 mo/19,026 mi  
**Avg CO2** / 1.19 lb/mi  
**Energy cons** / 207 kW-hrs/100 mi  
**Unresolved problems** / None  
**Maintenance cost** / \$0 (oil change, inspection, tire rotation)  
**Normal-wear cost** / \$175 (alignment)  
**Base price** / \$81,020 **As tested** / \$93,856

**FUEL ECON 16.3 MPG comb.**

Our California-based long-term testers don’t get a lot of cold-weather running. Come to think of it, not even the windshield wipers get used much, though this year’s El Niño is changing that. A 2,800-mile Thanksgiving road trip through Nevada, Idaho, Wyoming, and Utah gave the Range Rover Sport a solid pre-El Niño workout, however.

The mercury dropped as we raced a winter storm eastward from Boise, Idaho, to Jackson, Wyoming, snow falling much of the way. Interstate 84 out of Boise was treacherous, with poor visibility

and heavy slush, and the Range Rover’s 275/40 Continental CrossContact LX Sport all-season tires, grippy and responsive on California canyon roads, displayed a tendency to surf the slop rather than cutting through to the tarmac underneath. Changing lanes required care.

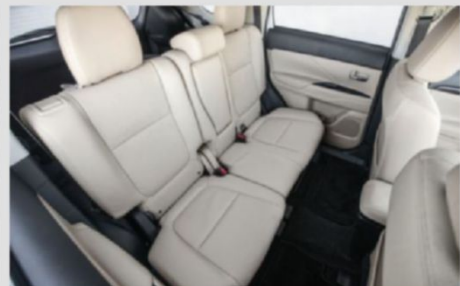
The fat, low-profile Contis felt better on the fresh snow we found on most of Route 20/26 in Idaho and on Route 89 in Wyoming and Utah. At one

Gentle cruising on snow-packed roads meant better than average fuel consumption, the Sport besting 19 mpg at times.

point, though, after several hours of gentle cruising on empty, snowy roads, I noticed the compliance in the suspension, normally so deep, progressive, and beautifully modulated even in the sportiest of Range Rovers, seemed to have disappeared. Ice buildup in the wheelwells reduced effective travel to little more than a few tenths of an inch.

Snow accumulation also shut down the cruise control because the radar wasn’t able to sense traffic ahead. Using cruise control on snowy roads isn’t a great idea anyway because arbitrary throttle and brake inputs don’t always mix well with low grip levels; better to set the Range Rover’s standard speed limiter and drive to the conditions.

The Range Rover Sport doesn’t need much prep to be winter road warrior. Continental makes a CrossContact winter tire that fits 22-inch rims. And swapping out the California-spec washer fluid—our jets froze, a problem when the windshield became smeared with grimy slush—for some serious low-temp stuff should keep the screen clean.



## 2016 Mitsubishi Outlander SEL S-AWC Alex Nishimoto



**“The four-cylinder Outlander can theoretically seat seven, but you’ll notice the extra weight.” @MT\_NishiMotor**

**Service life** / 4 mo/9,037 mi  
**Avg CO2** / 0.78 lb/mi  
**Energy cons** / 135 kW-hrs/100 mi  
**Unresolved problems** / None  
**Maintenance cost** / \$102.23 (oil change, inspection, tire rotation)  
**Normal-wear cost** / \$0  
**Base price** / \$27,845 **As tested** / \$33,095

**FUEL ECON 24.9 MPG comb.**

So far, our 2016 Mitsubishi Outlander hasn’t proven to be all that different from the 2014 model we last had in our fleet. To see if anything has changed performance-wise, we took the three-row crossover to the track.

Our SUV, a 2016 Outlander SEL S-AWC, is very close in spec to our 2014 Outlander SE S-AWC. Not surprisingly, the new model performed similarly in testing. Acceleration numbers are nearly identical, and braking distance from 60 to 0 mph is 119 feet, 3 feet more than its predecessor—perhaps due to

the 2016 model’s roughly 110 extra pounds. The one number that has increased significantly is its figure-eight lap time. The 2016 Outlander took 28.8 seconds to complete our figure-eight course, almost a second longer and with a lower average g than the 2014 model. You might be able to chalk that up to the extra weight, but it’s surprising that it’s that much slower despite the structural rigidity enhancements made for the 2016 refresh.

The second-row bench feels flimsy thanks to a flip-up cushion that never seats properly.

The naturally aspirated, 2.4-liter I-4 with its 166 hp and 162 lb-ft of torque may be on the small side for a vehicle weighing 3,651 pounds, but it’s fine with just two people onboard. It feels much less adequate once you start adding more weight. Driving dynamics are also greatly affected when more passengers and cargo enter the equation.

The interior is handsome in a minimalist sort of way, but there’s no denying that it looks dated—like something you might have expected to see in the last-generation SUV. Its throwback design isn’t the interior’s only problem, though. Build quality seems acceptable from the front seats, but the second-row bench is flimsy and grows less comfortable the longer passengers have to sit on it. The seat cushions flip forward to allow the bench to fold flat. I appreciate that feature but not at the expense of a cushion that always seems like it wants to pop up. You can push it down all you want, but it never feels like it’s seated properly.





For annoyed Murano owners out there, you can turn off the alerts under the info tab.



## 2015 Nissan Murano SL AWD William Walker



**"Flash flood warning 40 miles from your current location! Flash flood warn—I get it; be quiet Murano."**  
@MT\_dubdub

**Service life** / 6 mo/14,085 mi  
**Avg CO2** / 0.89 lb/mi  
**Energy cons** / 155 kW-hrs/100 mi  
**Unresolved problems** / None  
**Maintenance cost** / \$165 (oil change, inspection, tire rotation, cabin air filter)  
**Normal-wear cost** / \$0  
**Base price** / \$39,435  
**As tested** / \$41,905  
**REAL MPG FUEL ECON**  
21.7 MPG comb.

### Warning! Warning! Warning!

In Southern California the weather can change within a few miles, let alone in 40. Part of the Murano's XM radio subscription features weather and traffic alerts that pop up on the center screen to warn drivers of Mother Nature's worst. This feature, as helpful as some people may find it, is unbelievably annoying if you live somewhere with variable weather. Luckily, this feature has an off switch, although what it really

needs is the ability to narrow its warning radius. If you could narrow the focus down to 5 or 10 miles, it would be a lot more helpful for everyday use. Until then, I'll take my chances with the flash floods, high winds, high surf, and the vehicle traveling in the wrong direction. Los Angeles is scary!

Other than the annoying alerts, I've found the entertainment and navigation system has few faults.



## 2015 Acura TLX Mike Royer



**"Backup cameras are probably making America soft. Oh well. We had a good run."**  
@MT\_Royer

**Service life** / 9 mo/13,412 mi  
**Avg CO2** / 0.69 lb/mi  
**Energy cons** / 120 kW-hrs/100 mi  
**Unresolved problems** / None  
**Maintenance cost** / \$143.33 (oil change, inspection, tire rotation)  
**Normal-wear cost** / \$0  
**Base price** / \$32,365  
**As tested** / \$36,420  
**REAL MPG FUEL ECON**  
28.1 MPG comb.

the backup camera and side mirrors, I can see much better behind me where it counts than in front.

After weeks of trial and error, I settled on a method and have been able to directly back into the garage on one try. Without losing a mirror. The keys are to go slow, be patient, and thank the stars you have a backup camera. Wish me luck because I only have to screw it up once to invoke the wrath of Nate.

### After years of parking on the

street and paying for permits, I was stoked my new apartment comes with a single-car garage. Delight nearly turned to disappointment when I realized it was going to be a seriously tight fit—so tight I wasn't sure the TLX could squeeze in. The length is fine, but the width difference of the garage opening is well under a foot. A first attempt at heading into the space was quickly aborted. I reasoned that between



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## 2015 Subaru WRX STI Launch Edition Nate Martinez



**“Cars like the WRX STI don’t come along every day. Turbo flat-four. All-wheel drive. Manual tranny only. Rally pedigree.” @Nate\_Martinez**

**Some would** call my approach to chaperoning our long-term vehicles odd and perhaps a little inappropriate. For the past year I called *MT*’s long-term STI Launch Edition “mine,” and I took the owner’s mindset to heart. What would an owner do? I frequently wondered.

Ownership would go through phases, I thought. The STI would be enjoyed as it came from the factory. Its qualities endeared me from the get-go. It rumbled and shook on idle. Its muscly body and gigantic wing drew eyeballs, as did the blue paint, gold footwear (not pictured), and dinner plate-sized Brembos. All of it indicated specialness.

Easily accessible and highly capable, its dynamic prowess was backed by those eye-catching looks. Seldom was there a dull drive. Once I successfully mastered the engagement of its sumo-heavy clutch and homed in on the

**Service life** / 12 mo / 26,359 mi  
**Base price** / \$38,190  
**Options** / None  
**Price as tested** / \$38,190  
**Avg fuel econ/C02** / 20.3 mpg / 0.96 lb/mi  
**Problem areas** / Rear differential gasket, fuel pressure regulator  
**Maintenance cost** / \$0 (4-oil change, inspection; 2-tire rotation)  
**Normal-wear cost** / \$0  
**3-year residual value\*** / \$22,150  
**Recalls** / None

**REAL MPG CITY/HWY/COMB FUEL ECON**  
**21.6/24.9/23.0 MPG**

\*Automotive Lease Guide data

2.5-liter’s substantial 290 lb-ft of torque, it rewarded me with immense grip and ridiculous go. The symmetrical all-wheel drive’s active center differential allowed for the adjustment of torque distribution. I found that no other settings summoned the car’s full fury like full auto with SI-Drive in Sport Sharp. The car’s reactions at ten-tenths sharpened, and its overall athleticism felt barely hindered by electronic safety nets. It was raw and needed judicious inputs to truly master its intricacies. That isn’t to say the STI was a wild handful. It could be as docile as a Forester if desired.

Our Launch Edition did not skimp on amenities. Bluetooth, auxiliary ports, stowage galore, rearview camera, and automatic dual-zone climate control came standard. One of the most impressive features were LED headlamps that cast broad and sharp beams of intense light. Some of my audiophile passengers noted the lackluster audio system. However, I didn’t mind tinny tunes and the absence of turn-by-turn navigation.

Everyday driving wasn’t entirely complaint-free. Its looks attracted unwanted attention from street racers and law enforcement. I also exchanged friendly waves with fascinated Subaruistas. In heavy Los Angeles traffic, the clutch conjured few happy thoughts. And with a taut suspension and a boisterous exhaust, the car sapped passengers’ energy on extended drives. But like Subaruistas and inquisitive police, I considered it part of the STI way of life.

As winter came, so did another ownership phase. I decided to try an all-season wheel and tire combination provided by Tire Rack. A set of bright white 18-by-8.5-inch OZ Racing Alleggerita HLT wheels and Pirelli P Zero All Season Plus tires (245/40R18) culled 4.6 pounds per corner and ratcheted up steering tactility and grip in foul weather. I went for World Rally Championship flair, and I got it. STI’s optional aerodynamic kit (front lip, side skirts, rear flicks, diffuser) completed the look, and Thule’s high-quality rack system augmented







## 2015 Subaru WRX STI Launch Edition POWERTRAIN/CHASSIS

<b>DRIVETRAIN LAYOUT</b>	Front-engine, AWD
<b>ENGINE TYPE</b>	Turbocharged flat-4, alum block/heads
<b>VALVETRAIN</b>	DOHC, 4 valves/cyl
<b>DISPLACEMENT</b>	149.9 cu in/2,457cc
<b>COMPRESSION RATIO</b>	8.2:1
<b>POWER (SAE NET)</b>	305 hp @ 6,000 rpm
<b>TORQUE (SAE NET)</b>	290 lb-ft @ 4,000 rpm
<b>REDLINE</b>	6,700 rpm
<b>WEIGHT TO POWER</b>	11.1 lb/hp
<b>TRANSMISSION</b>	6-speed manual
<b>AXLE/FINAL-DRIVE RATIO</b>	3.90:1/2.95:1
<b>SUSPENSION, FRONT; REAR</b>	Struts, coil springs, anti-roll bar; multilink, coil springs, anti-roll bar
<b>STEERING RATIO</b>	13.0:1
<b>TURNS LOCK-TO-LOCK</b>	2.5
<b>BRAKES, F; R</b>	13.0-in vented disc; 12.4-in vented disc, ABS
<b>WHEELS</b>	8.5 x 18-in, forged aluminum
<b>TIRES</b>	245/40R18 97W Dunlop Sport Maxx RT

## DIMENSIONS

<b>WHEELBASE</b>	104.3 in
<b>TRACK, F/R</b>	60.2/60.6 in
<b>LENGTH X WIDTH X HEIGHT</b>	180.9 x 70.7 x 58.1 in
<b>TURNING CIRCLE</b>	36.0 ft
<b>CURB WEIGHT</b>	3,376 lb
<b>WEIGHT DIST, F/R</b>	59/41%
<b>SEATING CAPACITY</b>	5
<b>HEADROOM, F/R</b>	39.8/37.1 in
<b>LEGROOM, F/R</b>	43.3/35.4 in
<b>SHOULDER ROOM, F/R</b>	55.6/54.2 in
<b>CARGO VOLUME</b>	12.0 cu ft

## TEST DATA

<b>ACCELERATION TO MPH</b>	
<b>0-30</b>	1.5 sec
<b>0-40</b>	2.4
<b>0-50</b>	3.4
<b>0-60</b>	4.9
<b>0-70</b>	6.3
<b>0-80</b>	8.1
<b>0-90</b>	10.4
<b>0-100</b>	12.8
<b>PASSING, 45-65 MPH</b>	2.7
<b>QUARTER MILE</b>	13.4 sec @ 102.4 mph
<b>BRAKING, 60-0 MPH</b>	105 ft
<b>LATERAL ACCELERATION</b>	0.93 g (avg)
<b>MT FIGURE EIGHT</b>	25.2 sec @ 0.75 g (avg)
<b>TOP-GEAR REVS @ 60 MPH</b>	2,400 rpm

## CONSUMER INFO

<b>STABILITY/TRACTION CONTROL</b>	Yes/yes
<b>AIRBAGS</b>	Dual front, front side, f/r curtain, driver knee
<b>BASIC WARRANTY</b>	3 yrs/36,000 miles
<b>POWERTRAIN WARRANTY</b>	5 yrs/60,000 miles
<b>ROADSIDE ASSISTANCE</b>	3 yrs/36,000 miles
<b>FUEL CAPACITY</b>	15.9 gal
<b>EPA CITY/HWY/COMB ECON</b>	17/23/19 mpg
<b>ENERGY CONS, CITY/HWY</b>	198/147 kW-hrs/100 miles
<b>CO2 EMISSIONS, COMB</b>	1.01 lb/mile
<b>REAL MPG, CITY/HWY/COMB</b>	21.6/24.9/23.0 mpg
<b>RECOMMENDED FUEL</b>	Premium

our car's cargo-carrying capacity. As the rain waned, my drive to tinker accelerated.

A spring-summer track day phase came next. Our friends at Autofashion USA installed Bridgestone's ultra-sticky RE-71R tires (245/40R18), Advan Racing's GT wheel (9 by 18 inches), Brembo's Sport Kit drilled rotors, Project MU's B Force brake pads, and KW Suspension's Clubsport coil-overs. The modifications transformed the little rally machine into a little rally monster. Grip, turn-in, handling predictability, and braking consistency all improved. Ride quality suffered a bit, but my very basic enhancements resulted in positive change. Validation of the changes arrived when Randy Pobst lapped the STI at Streets of Willow. "I wouldn't change a thing, Nate," Pobst said following his session. In all the miles of hard driving and lapping, the STI never overheated or threw maintenance codes.

Maintenance proved to be as easy as wringing out more sportiness. After an important 1,000-mile break-in at sub-4,000-rpm engine speeds, I visited the dealer at prescribed 6,000-mile intervals. The routine was nearly identical each visit: change five quarts of 5W-30 synthetic lube and one oil filter; check and set tire pressures (they'd rotate them if needed); and perform a multipoint inspection. Service is covered by Subaru's new car purchase agreement for the duration of the basic warranty. A recall addressing a sticking fuel door was completed, as well.

Other notable services: At around 12,000 miles, I visited two dealers on three occasions to diagnose a hard start dilemma. Come to find out, my fuel regulator failed to maintain pressure. And at 24,000 miles, technicians replaced the STI's rear differential cover due to a gasket failure (covered by warranty). One word of caution: Be sure to hand tighten your lug nuts before torquing. I mistakenly stripped two wheel studs twice.

Our garage has welcomed a number of performance vehicles over the years, but none had a personality as audacious, involving, and versatile as that of the STI. Even our \$78,000 2015 BMW M3, whose four doors, dual-clutch transmission, and low-displacement turbocharged engine made it amenable to tracks days or grocery store runs, wasn't as engaging or as comfortable as the \$38,190 Launch Edition. Both, however, enjoyed free regular maintenance for the duration of their basic warranties. The STI made me work hard to play hard. I dug that. And when it was time to go to the market, I didn't have to deal with a clunky dual-clutch gearbox. I had a standard-issue rearview camera, too.

I can't remember how many times people asked me, "How do you like it?" over the course of my yearlong loan. But I do vividly recall one of my responses: "Driving the Subaru STI every day is a laborious yet easy, maddening yet enlightening, painful yet stupendously pleasurable experience. I love it."

**"Driving the STI is a laborious yet easy, maddening yet enlightening, painful yet pleasurable experience."**







## 2014 Kia Soul Exclaim Karla Sanchez



**"If I had to choose between our long-term Mercedes-Benz CLA250 with Sport package and the Kia Soul, I'd go with the Soul."**

**Well, that** went by fast. Through a year of manning the 2014 Kia Soul long-termer, the hamster-mobile warmed my heart in more ways than one. I never would've thought I'd be sad to see the Shrek-colored boxcar go, but after living with it, I can understand why the Soul has dominated sales charts.

In the year I had it, I moved twice and stuffed the Soul to the max. I wasn't the only one to take advantage of the Soul's spacious interior, as it was requested as a support vehicle for photography purposes on multiple occasions. Other staffers found themselves loading it with their snow gear and skis, as well as party tables and chairs.

Although it looks funky on the outside, the Soul's interior is surprisingly refined with leather-wrapped elements and just enough shiny black and anodized-look plastic trim to make it look nice, not

**Service life** / 15 mo / 23,186 mi

**Base price** / \$21,295

**Options** / Sun and Sound package (\$2,600: auto climate control, panoramic sunroof), Whole Shabang package (\$2,500: HIDs, leather, keyless entry with push-button start, heated and cooled front seats), carpeted floor mats (\$115), rear bumper applique (\$75), cargo net (\$50)

**Price as tested** / \$26,635

**Avg fuel econ/C02** / 24.3 mpg / 0.80 lb/mi

**Problem areas** / Loose liftgate trim

**Maintenance cost** / \$127.32 (2-oil change, inspection, tire rotation)

**Normal-wear cost** / \$0

**3-year residual value\*** / \$13,584

**Recalls** / Steering rack, accelerator pedal

**REAL MPG CITY/HWY/COMB FUEL ECON**  
22.4/31.2/25.6 MPG

\*Automotive Lease Guide data



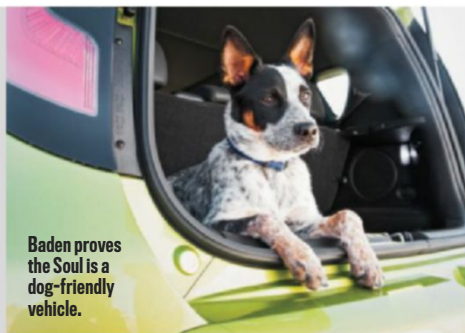
**Not pictured:**  
groovy, color-changing speaker mood lighting.

cheap. The dash is covered in soft-touch material, and the black stitching on the perforated black leather is tight and nicely constructed. Some other (more expensive) cars have just a mesh lining covering the panoramic sunroof, but the Soul's was thick enough to completely keep out the sun. Even though its interior proved to be very much grown-up, the Soul still stayed true to its funky roots with unique elements such as the tweeters mounted on top of the HVAC vents.

Reactions from almost everyone who first stepped inside the Soul went a little something like this: "Whoa. It's actually really nice in here." It never failed. Not once did anyone ever complain about legroom or headroom, and I personally appreciated the easy ingress and egress. Even though I don't have any little ones yet, I'd imagine the Soul would be a stylish alternative for small families. That's because over the past year, I watched my puppy grow from a little 8-pound thing to a 46-pound beast in the Soul, and strapping his doggie seat belt into the back seat was always a breeze thanks to the easy entry and exit. He also enjoyed himself back there, as the seats had a good seat-back-to-seat-cushion ratio, allowing him to sit upright in a comfortable position. He seemed to think overall visibility of the Soul was great, too, especially because he could easily see out the large windows and rest his head on the low sill.







Baden proves the Soul is a dog-friendly vehicle.



Small on the outside, big on the inside.

While I drove the Soul, the hatch proved relatively inexpensive to maintain. Aside from a piece of loose black liftgate trim, we had no issues with the car, which tallied \$127.32 in maintenance costs. Our long-term Mazda3 S GT, which carried an as-tested price within \$1,000 of our \$26,635 Soul, cost \$162.55 to maintain. Our all-wheel-drive 2012 Subaru Impreza Sport Limited cost \$315.01 and our long-term 2013 Kia Rio SX, which traveled about 16,000 miles more than our Soul and visited the dealer for maintenance more often, cost \$215.55.

So what will I miss the most? Heated front seats, heated rear seats, cooled front seats, the massive panoramic sunroof, and the 18 radio station presets. It seems like I'll just miss the premium features more than the actual car, but that's not entirely true. The Soul did surprise me with its capable performance, which I really became familiar with on a new route home from work. Instead of driving on the traffic-choked 405 freeway over the notorious Sepulveda Pass, I started taking a detour through the canyon, and the Soul was able to hang through every quick turn. I underestimated the Soul; I thought it would exhibit tons of body roll through the curves, but it stayed planted with each flick of the steering wheel. It may not handle like our Subaru WRX STI, but it's still more than capable of making the average driver feel confident.

If the Soul Exclaim's 164-hp, 2.0-liter four-banger left me wanting a bit more, I can't imagine what it'd

be like driving the base model, which makes an anemic 130 hp by way of a 1.6-liter I-4. But if engine performance isn't a big priority, the Soul's blend of refinement, value, and fun styling should be more than enough to win consumers over. Although the models come standard with plenty of niceties, I highly suggest opting for some of the packages; the premium features definitely helped the Soul earn high marks.

Of course, it wasn't all perfect. Although the UVO infotainment system was super easy to use with a very responsive touchscreen, I wish it had more smartphonelike capabilities for things such as viewing the map. It's hard trying to zoom in by pushing buttons on a touchscreen, so it'd be cool to just use the same gestures one would use to zoom in and out on a phone. Either way, the screen is good quality, which becomes apparent when the sun hits it. There's no reflection, and it does a good job of hiding fingertip smudges. Back to the downsides, the voice-control system is not the best, frequently requiring that I repeat myself several times in certain instances. There was also a fit and finish issue with the exterior—as we noted, the black plastic trim on the tailgate was starting to lift.

After a year behind the wheel, I grew to appreciate what the Soul was good at, realizing that it has more pros than cons. I never would have considered the Soul before my time in it, and now I'm very sad to see it go. ■

I never would have considered the Soul before my time in it, and now I'm very sad to see it go.



## 2014 Kia Soul Exclaim POWERTRAIN/CHASSIS

<b>DRIVETRAIN LAYOUT</b>	Front-engine, FWD
<b>ENGINE TYPE</b>	I-4, aluminum block/head
<b>VALVETRAIN</b>	DOHC, 4 valves/cyl
<b>DISPLACEMENT</b>	122.0 cu in/1,999cc
<b>COMPRESSION RATIO</b>	11.5:1
<b>POWER (SAE NET)</b>	164 hp @ 6,200 rpm
<b>TORQUE (SAE NET)</b>	151 lb-ft @ 4,000 rpm
<b>REDLINE</b>	6,750 rpm
<b>WEIGHT TO POWER</b>	18.8 lb/hp
<b>TRANSMISSION</b>	6-speed automatic
<b>AXLE/FINAL-DRIVE RATIO</b>	3.27:1/2.49:1
<b>SUSPENSION, FRONT; REAR</b>	Struts, coil springs, anti-roll bar; torsion beam, coil springs
<b>STEERING RATIO</b>	15.7:1
<b>TURNS LOCK-TO-LOCK</b>	2.9
<b>BRAKES, F; R</b>	11.0-in vented disc; 10.3-in disc, ABS
<b>WHEELS</b>	7.5 x 18-in, cast aluminum
<b>TIRES</b>	235/45R18 94V M+S Nexen Classe Premiere CP671

## DIMENSIONS

<b>WHEELBASE</b>	101.2 in
<b>TRACK, F/R</b>	61.4/61.9 in
<b>LENGTH X WIDTH X HEIGHT</b>	163.0 x 70.9 x 63.0 in
<b>TURNING CIRCLE</b>	34.8 ft
<b>CURB WEIGHT</b>	3,076 lb
<b>WEIGHT DIST, F/R</b>	60/40%
<b>SEATING CAPACITY</b>	5
<b>HEADROOM, F/R</b>	39.6/39.5 in
<b>LEGROOM, F/R</b>	40.9/39.1 in
<b>SHOULDER ROOM, F/R</b>	55.5/54.7 in
<b>CARGO VOLUME BEH F/R</b>	49.5/18.8 cu ft

## TEST DATA

<b>ACCELERATION TO MPH</b>	
<b>0-30</b>	2.9 sec
<b>0-40</b>	4.4
<b>0-50</b>	6.3
<b>0-60</b>	8.6
<b>0-70</b>	11.6
<b>0-80</b>	14.9
<b>0-90</b>	19.8
<b>PASSING, 45-65 MPH</b>	4.7
<b>QUARTER MILE</b>	16.6 sec @ 84.3 mph
<b>BRAKING, 60-0 MPH</b>	114 ft
<b>LATERAL ACCELERATION</b>	0.80 g (avg)
<b>MT FIGURE EIGHT</b>	28.1 sec @ 0.62 g (avg)
<b>TOP-GEAR REVS @ 60 MPH</b>	2,000 rpm

## CONSUMER INFO

<b>STABILITY/TRACTION CONTROL</b>	Yes/yes
<b>AIRBAGS</b>	Dual front, front side, f/r curtain
<b>BASIC WARRANTY</b>	5 yrs/60,000 miles
<b>POWERTRAIN WARRANTY</b>	10 yrs/100,000 miles
<b>ROADSIDE ASSISTANCE</b>	5 yrs/60,000 miles
<b>FUEL CAPACITY</b>	14.2 gal
<b>EPA CITY/HWY/COMB ECON</b>	23/31/26 mpg
<b>ENERGY CONS, CITY/HWY</b>	147/109 kW-hrs/100 miles
<b>CO2 EMISSIONS, COMB</b>	0.75 lb/mile
<b>REAL MPG, CITY/HWY/COMB</b>	22.4/31.2/25.6 mpg
<b>RECOMMENDED FUEL</b>	Unleaded regular





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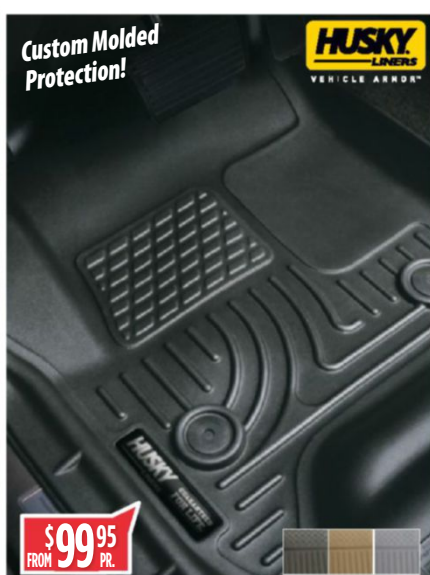
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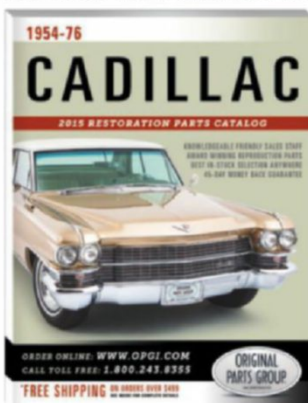
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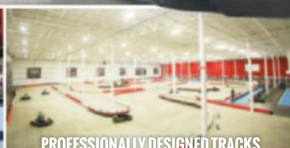
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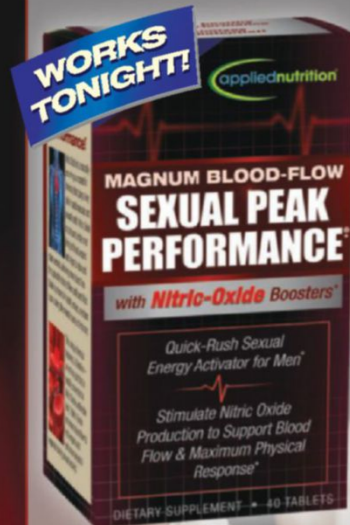
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Angus MacKenzie

# The Big Picture



## THE GIFT

### PASSING ON THE PASSION



There's a photo of him hunched over the handlebars of an old bicycle, a gangly, knockabout teenager with a ready smile. My favorite pic, though, was taken more than 30 years later. His Yamaha YZ250 is stuck fast in the mud midway through a 24-hour enduro. He's been wrestling to extract the damned thing for an age, and now he's sat there, helmet off, taking a breather. He's tired and aching, but the smile's still there. He grew old. But a part of him never really grew up.

He could make anything. He once made his own telescope, spending hours a night for six months painstakingly hand-grinding a mirror for it, mainly because he didn't have the money to buy one, but also, I suspect, partly because he couldn't see why he shouldn't be able to make one. We'd sit, backs to a campfire, the absolute darkness of the Australian outback seeping in all around us, as he pointed out the stars and the planets and the constellations in the glittering firmament above.

He loved to travel, collected rocks and minerals, and made jewelry, but his real passion was cars. His taste was eclectic. He never had the means to purchase what he really wanted; for years he talked wistfully of the \$600 Bugatti he once saw in a used car lot, ruefully reflecting that for a young apprentice mechanic that modest sum was, at the time, more than a year's wages. But he made up for that with a quiet confidence in his ability to make anything with an internal combustion engine run.

He had a couple of old Dodges in the early days because they were tough and reliable in the bush. There were also a couple Rileys, scruffy old British aristocrats that smelled of cracked leather seats and varnished walnut. Renaults,

too, including a tiny, beetle-backed 750—French blue, of course—that was running on one cylinder when he got it home, and a bright yellow Renault 12 whose rear brakes developed an annoying habit of seizing for no apparent reason.

An old Mini 850 was given twin carbs, a big-bore exhaust, and a short-throw remote shift linkage he engineered and built himself. He bought an ex-Australian Army short wheelbase Land Rover and fitted it with a Holden six-cylinder engine and an innovative aluminum hardtop of his own design and construction. Later came a down-at-heel Toyota LandCruiser FJ55, which he rebuilt and refurbished.

**His Yamaha YZ250 is stuck fast in the mud midway through a 24-hour enduro. He's tired and aching, but the smile's still there. He grew old. But a part of him never really grew up.**

Then there were the Alfas. He fell in love with the 1968 Type 105 GTV I bought in the late 1970s, marveling at the quality of its engineering, the elegance of its design, and, of course, the way it drove, especially compared with the rattier, more expensive MGBs I'd been looking at buying. The Alfa was cheaper because most local mechanics ran a mile from its twin-cam engine and dual Weber carbs, preferring the simple obduracy of a leaky old Austin OHV four with electrics by Lucas, the Prince of Darkness. And, truth be told, I only bought the Alfa because I knew he could fix it if anything went wrong.

Inspired, he found a rusty old Giulia Super sedan he fitted with a trailer hitch so it could haul his motocross bikes. Then came a 1967 Type 105 GTV that he stripped back to bare metal and rebuilt before using it for years as a daily driver. Almost 35 years later, that same car now sits in a corner of my garage here in America, awaiting its second restoration.

He was a gentle man. Capable. Dependable. Most of all he was a wonderful teacher. As a kid I'd be there with him in the shed, handing him the spanners as he patiently explained what he was doing and why. And just as I'd learned from him about the stars and the rocks and the extraordinary world in which we lived, I learned about cars. He gave me the passion.

Lindsay Athol MacKenzie, 1932-2016. Rest in peace, Dad. And thanks. ■

**Lindsay Athol MacKenzie, 1932-2016**





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